THE AMERICAN JOURNAL OF PHARMACY.

PUBLISHED BY AUTHORITY OF THE

PHILADELPHIA COLLEGE OF PHARMACY.

EDITED BY

HENRY TRIMBLE.

PUBLISHING COMMITTEE FOR 1896.

HENRY N. RITTENHOUSE,
SAMUEL P. SADTLER,
WALLACE PROCTER,
JOSEPH W. ENGLAND,
AND THE EDITOR.

VOLUME 68.

PHILADELPHIA:
1896.

THE AMERICAN
JOURNAL OF PHARMACY

JANUARY, 1896.

DISTILLED WATER.[1]

J. U. LLOYD.

(*Continued from page 196, 1895*).

It was found (see this JOURNAL, 1895, p. 190) that, by means of a stone condenser, ordinary Ohio River water could be employed to make distilled water that would stand the requirements of the U. S. P. concerning organic matter.

Inorganic Matter.—It was also stated that, by means of evaporation in platinum, this water left visible rings of inorganic matter. On determining the amount of this matter, it was found that 100,000 c.c. left 1·8 gm. of residue, which proved to be dissolved stone, and constant. Tucker[2] gives the following limits of observed residues with glass condensers:

100,000 parts of water left from 2·20 to 23·00 parts of residue. In this connection it may be stated that glass, tin, stone and aluminum condensers all leave residues, which, as Prof. T. H. Norton is investigating the subject, will not be considered in detail here.

Keeping Qualities of Distilled Water.—In this direction, the question presenting itself is as to what length of time, under ordinary shop conditions, distilled water may be kept. While it is evident that in securely sealed bottles no change can occur to alter the

[1] The author extends his thanks to Dr. Sigmond Waldbott for assistance in details of this work.

[2] The Adulteration of Drugs. A lecture delivered before the Department of Chemistry of the Brooklyn Institute of Arts and Sciences, May 24, 1895, by Willis G. Tucker.

organic constituents, still, in bottles drawn from in the course of business, the question of increasing organic contamination is pertinent.

March 4th, two 5-pint glass-stoppered bottles were filled with water fresh from the still.

A was closed with the glass stopper, loosely covered with a cap of parchment paper, and was successively tested: March 6th, 7th, 11th, 27th, April 4th, 15th, May 16th, June 12th, August 23d, and December 3d.

Each time, of course, the usual atmosphere replaced the abstracted liquid, but the water stood the test in all instances; in the last examination, the pinkish tint faded considerably upon 10 minutes' boiling, but was still apparent the following day.

B was provided with a cork stopper, having two perforations, through which were inserted a thistle tube containing sulphuric acid, and a siphon tube with stopcock. A plug of absorbent cotton was placed in the funnel of the thistle tube.

This precautionary experiment was probably unnecessary, as shown by the result of *A*; however, the water was tested March 7th, 11th, April 4th, 15th, May 16th, June 12th, and December 4th, without evidence of material change.

It was noticed that the pinkish tint faded less than in the case of *A*, hence, it is manifest that distilled water kept in a bottle protected as before described, deteriorates less than under ordinary precautions.

Another series of tests was made of distilled water kept in smaller bottles, as follows:

March 15th, fourteen glass-stoppered quart bottles, perfectly clean, were filled successively from the still, with water that stood the permanganate test of the U. S. P. A paper cone was inverted over the neck of each bottle, the intention being to examine the bottles successively each month. They were placed on a shelf in the laboratory.

Bottle I was further tested April 15th, May 16th, June 17th, August 23d and December 4th. The last portion stood the permanganate test perfectly, and this notwithstanding the fact that flakes had collected at the bottom of the bottle.

As the first bottle opened gave no evidence of organic change, it might have been deemed unnecessary to disturb all of the fourteen

sample specimens. Still, a few more were opened, as all of them contained a flaky sediment.

The following results were obtained:

II stood the test March 14th, August 23d and December 4th.

III and IV March 14th and December 4th.

V was examined with a view of determining how distilled water would keep in a bottle loosely covered with tissue paper only.

Water, distilled March 4th and contained in a glass-stoppered bottle, stood the test March 14th and June 17th. The stopper being removed, the mouth of the bottle was now loosely covered with tissue paper and the bottle placed on a shelf in the laboratory and tested again August 23d. It stood the test very well, but a sort of scum, resembling a fungus growth, had collected on top of the water. At the date of writing this (December 4th) the quantity of scum has increased, and a sediment has also formed. The clear intermediate liquid, withdrawn by means of a clean pipette, stands the permanganate test very well; but another portion into which some of the large flakes were introduced purposely, was gradually decolorized by ten minutes' boiling. These flakes, however, which appear identical in their nature with those to be found in each of the fourteen closed quart bottles, consist of inorganic material for the most part, but also contain organic matter, as incineration or treatment with sulphuric acid will demonstrate. Whether the inorganic portion of these flakes is only the inorganic matter which is held in solution by the distilled water, or whether they are due partly to some corroding influence exerted by the water upon the substance of the glass, is a point that was not determined in these experiments.

In now comparing the keeping qualities of distilled water, it is manifest, as shown by these experiments, that water remains almost unimpaired with regard to the permanganate test of the U. S. P. during a period of several months, and probably will stand much longer, if the water is contained in quart bottles, even though it be withdrawn in parts at intervals. In larger bottles, say of 5 pints, the water gradually deteriorates during a period of several months if no special precautions are taken to purify the air entering in the place of the water withdrawn from the bottle.

During the examinations it was found that, in the presence of tobacco smoke, and also the vapor of nicotine in the air of the

laboratory, the permanganate test was inoperative, the same being true in the presence of iodine vapors. Upon carrying the same quality of water to localities free from such contaminations, it stood the permanganate reaction, thus showing that the tests should not be made in the presence of certain atmospheric impurities.

From the results of the first series of investigations (see this JOURNAL, 1895, p. 190), it is seen that with suitable apparatus distilled water, to withstand the rigid organic test of the U. S. P., may be obtained direct from ordinary river water. In this connection it may be stated that the same good results have followed with water distilled during the entire season, both in summer and in winter.

Contrary to the preconceived opinion of the writer, no organic disturbance results in such water during the usual time that would be employed in emptying a medium-sized container. Under ordinary conditions, and without special precaution, it can be used for dispensing purposes with confidence.

In applying the permanganate test the condition of the atmosphere might lead to incorrect conclusions concerning the water.

All distilled water encountered to date contains inorganic matter in solution, enough, under the conditions named in this paper, to deposit a sediment in time. This sediment also holds organic matter as an invariable constituent, which it seems difficult to exclude entirely in the making and keeping of the distilled water. Still the amount contained in the latter is so small that it does not perceptibly interfere with the permanganate test.

Conclusion.—(1) It is impractical (by reason of inorganic impurity) to make distilled water in glass, stone or ordinary metal condensers that will stand the pharmacopœial test.

"When 1,000 c.c. of distilled water are evaporated on a water bath to dryness, *no residue* should remain."—U. S. P.

(2) The pharmacopœial test (permanganate) for organic impurities is not too rigid.

(3) Precautions should be given in the Pharmacopœia that the permanganate test be not applied in a very impure atmosphere.

(4) If the neck of the bottle be protected with an inverted paper cap or other cover, and the operator is careful not to touch the lip of the bottle with his hand, the water will retain its purity and the Pharmacopœia can demand that distilled water used for dispensing withstand the present test for organic matter.

SOME OBSERVATIONS REGARDING KOLA NUTS.

BY ALFRED R. L. DOHME AND HERMANN ENGELHARDT.

The kola nut (Cola Acuminata) originally was obtained exclusively from Africa, principally from the country south of Abyssinia, where, too, another caffeine-yielding plant, the well-known coffee bean (Coffea Arabica) is indigenous. As this drug has become so well known and popular recently, and as its properties and a description of its botany, chemistry, pharmacognosy and pharmacology have become generally known among pharmacists, a repetition of these will be unnecessary here. From most parts of Northern Africa considerable quantities are shipped, principally from Sierra Leone, Gambia, Kano and Timbuctoo. The most highly prized varieties are those raised in Kong and the Mandingo lands, although it has been customary to assume that the kola nuts from Jamaica are the most desirable. The Jamaica nuts are unquestionably larger and handsomer in appearance, but it has often been shown that the handsomest and boldest varieties or parts of the plant are not the most valuable medicinally. We know that the virtue of a drug depends upon one or more ingredients, and the criterion, hence, for a medicinally active and desirable drug, is the amount of active ingredient that it contains, as determined by assay. It is, of course, desirable and expedient that the U. S. P. should give processes of assay for all drugs that contain active principles, and then establish a certain percentage of active principle as a standard for each drug. This, it appears to the writers, is one of the foremost problems that should confront and occupy the attention of the Committee on Revision of the U. S. Pharmacopœia. The problem, which is the most desirable variety of kola nut, in so far as it contains the most caffeine, has several times presented itself to the writer, and it was a question if West India kola nuts were actually worth 25 per cent. more than African nuts. It has been pretty well established that all that possesses any value in kola nut is the caffeine, for the analysis of Schlotterbeck and Knox[1] brings to light nothing else that might be considered of value medicinally, for 3 per cent. of tannic acid, 4 of sugar and 35 of starch, can hardly be given any medicinal value. Attfield[2] found that kola nuts contain 2 per cent. caffeine, whereas

[1] *Proc. Amer. Phar. Asso.*, 1895.

[2] AMER. JOUR. PHARM., 1865, p. 205, and *Jahresbericht der Pharmacie*, 1865, p. 157.

Heckel and Schlagdenhauffen[3] obtained as much as 2·3 per cent. caffeine, and, besides this, theobromine, 0·023 per cent.; fats, 0·5 per cent.; tannic acid, 1·59 per cent.; starch, 33·7 per cent. Schlotterbeck and Knox obtained practically the same figures as these, but none of these investigators state whether they used West Indian or African kola nuts. Good typical samples of both these varieties of kola nuts in the dry state were procured from reliable sources. The African nuts were not prepossessing in appearance, being smaller and darker than the Jamaica nuts, and more shrivelled and less perfectly cured than these. Two methods of assay were tried in case of each kind of nut, using chloroform in the one and 33⅓ per cent. alcohol in the other, as boiling with pure water was impracticable, on account of the large amount of starch contained in the nuts.

Method I.—This was similar to that employed by Schlotterbeck and Knox, and consisted merely in extracting the powdered nuts in a Soxhlet apparatus until the chloroform runnings no longer yielded a residue, evaporating off the chloroform and evaporating the residue to dryness on a water-bath with calcined magnesia and sand, in a flat porcelain dish. This dry powder was then placed in an Erlenmeyer flask, and boiled with chloroform on a water-bath. It was necessary to put a cork fitted with a small condenser or a long glass tube on the flask, so as to avoid loss of chloroform. After heating to boiling for half an hour, the contents of the flask were allowed to cool, and then filtered into a tared flask. On distilling off all the chloroform, and heating the flask for half an hour on a water-bath at 100° C., it was weighed and the amount of caffeine obtained thus determined. The caffeine obtained was not quite white, but had a light brownish tint.

Method II.—The powdered nuts were boiled in an Erlenmeyer flask with an inverted condenser or long tube attached, on a water-bath for three hours, with a mixture of two parts of water and one part of alcohol by volume. Part of the starch will, of course, be hydrolyzed, but not sufficient to render filtration impossible. The contents of the flask, after cooling, were filtered, and the filtrate evaporated nearly to dryness on a water-bath in a porcelain dish. When nearly to dryness, calcined magnesia and sand were added, and all evaporated to complete dryness, stirring carefully and frequently. The residue

[3] *H. and S.*, "Des Kolas Africains," Paris, 1884, Masson.

was then transferred to an Erlenmeyer flask and exhausted with chloroform and treated just as in case of Method I. The caffeine obtained by Method II was of a pure white color, and was hence purer than that obtained by Method I. Besides this advantage of Method II over Method I, may be mentioned the fact that Method II was much more expeditious and satisfactory, and extracted more caffeine than Method I.

Below are appended the results:

	African Nuts.	Jamaica Nuts.
Method I.—Caffeine	2·04 per cent.	1·75 per cent.
Method II.—Caffeine	2·24 "	1·93 "

These figures would indicate that the African kola nuts are richer in caffeine than the West India nuts, which was not to be expected, considering that the latter are the more expensive; furthermore, they show that the method which uses 33⅓ per cent. alcohol extracts the caffeine more completely than does the method which uses pure chloroform. The extract obtained from the Jamaica nuts was lighter in color than that from the African nuts, and resembled a tea infusion, whereas the extract from the latter resembled an infusion of coffee in color.

BALTIMORE, November 25, 1895.

SPERMACETI.

BY LYMAN F. KEBLER.

Cetaceum forms lustrous, white, semi-translucent masses, with a broad, foliaceous, crystalline structure; somewhat unctuous to the touch, and, when fresh, has a neutral reaction. It is soluble in chloroform, ether, carbon disulphide, boiling alcohol, and fixed and volatile oils. The United States Pharmacopœia requires it to possess a specific gravity "about 0·943, and a fusing point near 50° C."

About two years ago, the writer had occasion to examine several samples of spermaceti, and was much surprised to find that his data of specific gravities and melting points did not correspond with the above authority, while in all other points there was perfect accord. On consulting the various dictionaries and other works of reference on chemistry, it was found that they generally sustained the official guide. After carefully examining the samples for adulterants, with

negative results, and being well aware that this peculiar, concrete, fatty substance was not readily adulterated, as any foreign substance greatly disturbed its physical character, the writer was forced to the conclusion that the samples were genuine. From this time, data were accumulated from various sources.

On carefully comparing the recorded specific gravities, at 15° C., it was observed that they were practically derived from two sources. E. Dieterich,[1] in a tabulated list of specific gravities for a number of fatty bodies, records 0·96 for cetaceum. This has been copied very little, and Mr. Dieterich practically stands alone in his observation. The lower specific gravity, 0·943, is generally credited to C. Schaedler,[2] but it really originated in 1820 with T. Saussure.[3] Mr. A. H. Allen[4] gives 0·942–0·946 as specific gravity. In several instances, 0·945 is given, but no original communication could be found to sustain it.

The melting point of spermaceti received a greater share of attention by the various workers. The reports are as follows: T. Saussure,[3] 47° C.; E. Chevreul,[5] 44° C.; J. Stenhouse,[6] 41·6° C.; T. Wimmel,[7] 44°–44·5° C.; F. Rüdorff,[8] 43·5°–44·3° C. Mr. Wimmel,[9] in his contribution, reports the following observations of melting points by a number of eminent workers: Person, 42·7; Berzelius, 44·7; Liebig, Bolly, 44–45; Chateau, Schubarth, 45; Bunsen, 47·7; Pouillet, Müller, 49; Dulk, 50° C.

Chevreul[10] obtained a body by repeatedly recrystallizing spermaceti from hot alcohol, that possessed a melting point of 49° C. To this substance, in 1814, he applied the name cetine, to differentiate the absolutely pure substance from the commercial article, which fused at 44° C. The following additional melting points for cetine have been observed: Stenhouse,[11] 48·9°–49·4° C., and W.

---

[1] 1882, Geschäfts-Ber. v. E. Dieterich; Arch. d. Pharm., (3), **20**, 454.

[2] 1883, Die Technologie der Fette u. Oele des Pflanzen- u. Thierreichs, p. 679.

[3] 1820, Ann. Chim. Phys., (2), **13**, 340.

[4] Dict. Appl. Chem. (Thorpe), **3**, 34.

[5] 1823, Recherches Chemique sur les corps gras d'origine animale, p. 170, 237.

[6] 1842, Phil. Mag., (3), **20**, 271; J. prakt. Chem., **27**, 253.

[7] 1868, Ann. Pogg., **133**, 121.

[8] 1872, Ann. Pogg., **145**, 279.

[9] 1868, Ann. Pogg., **133**, 135.

[10] 1823, Recherches s. l. corps gras, p. 176.

[11] See reference (6) above.

Heintz,[12] in his classic communications, reports a cetine which he obtained by repeated recrystallizations that melted as high as 55·5° C.

After eliminating the extremely high specific gravity, 0·96, and the high fusing points, 49 and 50° C., which probably represent cetine, there are left the following recorded constants: spermaceti, melting from 41·6 to 47·7° C., and specific gravity, approximating 0·943 at 15° C.; cetine fusing from 48·9 to 55·5° C.

To what extent the above constants agree with those obtained in the course of this investigation, the following table will show:

Number.	Melting Point. Degrees C.	Specific Gravity at 15° C.	Acid Number.	Ether Number.
1	44·5	0·935	5·17	134·6
2	43·5	0·935	2·33	125·8
3	44·5	0·939	1·18	128·9
4	44·5	0·939	1·13	126·2
5	44·0	0·942	0	127·6
6	44·0	0·933	0	126·9
7	45·0	0·920	1·40	126·0
8	46·0	0·933	0	127·4
9	45·0	0·925	0	0
10	47·0	0·925	0·90	127·8
11	45·0	0·915	0·70	129·0
12	45·0	0·920	1·43	132·0
13	46·0	0·925	1·05	128·0
14	47·0	0·930	1·43	131·0
15	45·0	0·905	1·90	128·3
16	43·0	0·925	0	131·6
17	46·0	0·930	0·70	129·0

No. 1 was obtained from Prof. Trimble, being a sample of the specimen in the Museum. It was obtained from New Bedford, and placed in the Museum of this College in 1877. The extremely high acid number indicates old age. No. 2 was furnished by Prof. Stevens, of the University of Michigan; he did not vouch for its purity. No. 3 was kindly sent by Mr. England. It was represented to him to be pure, and it was a very nice article. Nos. 4 to 17, inclusive, represent data obtained from samples taken from 90 cases, representing about 4,700 pounds of spermaceti. All this was procured

[12] 1851, Ann. Pogg., 84. 231; 1852, Ann. Pogg., 87, 21, 267.

directly from New Bedford, Mass. No. 5 represents a sample of spermaceti that was recrystallized twice from absolute alcohol.

The above results will not be a matter of surprise, when we recall that spermaceti, like a number of other animal products, is a mixture of severally fatty bodies. According to Heintz, even cetine is a mixture of cetyl palmitate and esters of stearic, myristic and lauro-stearic acids.

The melting point was taken as follows: dip the bulb of the thermometer into the sample of melted spermaceti an instant; on removing and cooling, the bulb will be covered with a fine film of the spermaceti. Introduce the thermometer into a large test-tube, through its perforated stopple. The stopple must have a second perforation or other device for equalizing the pressure. The test-tube is now introduced into warm water, the temperature and the film carefully watched, and the instant a hanging drop is formed, the temperature noted and recorded as the melting point.

The specific gravity was determined by diluting alcohol so that the pellets of the spermaceti would float indifferently in it. The specific gravity of the diluted alcohol being identical with that of the floating pellets, it was necessary only to secure the specific gravity of the liquid in the usual manner.

The writer considers the acid and the ether numbers the most reliable constants for spermaceti. Adulterations must be most cleverly adjusted so as not to disturb these constants, and at the same time not destroy the peculiar crystalline structure.

From the above accumulated data, the writer concludes: (1) the melting point of spermaceti varies from 42 to 47° C., while that of cetine varies from 48·9 to 55·5° C.; (2) the specific gravity ranges from 0·905 to 0·945, at 15° C., and does not approximate 0·943 so rigidly as formerly reported; (3) the saponification number ranges from 125·8 to 134·6, while the acid number varies with the age of the sample; and lastly, that the requirements of the Pharmacopœia are those for cetine, and not spermaceti.

305 Cherry Street, Philadelphia.

BEECHNUT OIL.

BY CHARLES H. LAWALL.

The American beech tree, Fagus atropunicea, Marshall,[1] Fagus ferruginea, Aiton, natural order Cupuliferæ, has been the subject of much controversy as to whether the variable forms which it assumes have a right to be considered distinct species or merely varieties. Gray's Botany of the Northern United States, 1889, recognizes but one species, Fagus ferruginea. The existence of at least two distinct species was claimed by Michaux[2], who brought forth numerous points of difference, which will be referred to later.

Cut-leaved, weeping and other varieties of beech have been introduced by cultivation. They do not, as a rule, form permanent varieties, but show a tendency to revert to the original species, which, in the cut-leaved variety, is often noticed by a single spray of leaves, going back to the original form.[3] The beech has been the subject of much literature, and, except where direct mention is made of the American beech, the references will be understood to apply to the European beech, Fagus sylvatica.

The name beech is derived from the Anglo-Saxon boc, bece or beoce; German, Buche; Swedish, bok, the words meaning at once a book and a beech tree. The allusion to books is doubtless derived from the knowledge that the ancient Runic tablets were formed of thin boards of beechwood. The origin of the word, according to Prior ("Popular Names of British Plants") is identical with the Sanskrit Boko letters, Bokos writings.[4] The generic name Fagus is the classical Latin name, which is derived from φάγω, to eat, in allusion to the esculent nuts.[5]

The beech is a large, stately tree, thriving on sandy or chalky soil, according to some writers, while others claim that it prefers a light loamy soil, mixed with pebbles. It is a handsome tree in all stages of its growth, the graceful spread of the straight, tapering branches

---

[1]A change proposed at the meeting of the Botanical Section of the A. A. A. S., 1893.

[2] 1819, North American Sylva, Vol. III.

[3] 1882, F. B. Hough, "Report on Forestry," United States Department Agriculture.

[4] 1890, Encyclopedia Brittannica.

[5] 1889, Gray's "Botany of the Northern United States.

being very characteristic, and the pale, smooth bark affording a pleasing contrast to its neighbors in the forest, and seeming to offer special inducements for the carving of initials and dates, which are rendered both artistic and permanent by Nature after a few years' time, and which often remain legible for half a century.

The power which the beech possesses of holding the ground, where climatic conditions as well as soil are favorable, is probably due to its deep shade hindering or preventing the growth of rivals. The drip from its branches is also said to be more injurious to plants than that from other trees. It sometimes attains a height of 130 feet, and often prospers for several centuries.

Beechwood is scarcely suitable for carpentry, as it does not resist either moisture or atmospheric changes, but it is used largely in cabinet-making, and for a variety of minor purposes. Beechwood is very good fuel, and for making charcoal it is said to be surpassed only by willow. In the destructive distillation of wood, creosote is one of the products, and that prepared from beechwood is given preference by pharmaceutical and medical authorities.

The inflorescence of the beech is of two kinds; the sterile flowers are capitate, clustered on drooping peduncles with deciduous scale-like bracts. The fertile flowers are usually in pairs at the apex of a short peduncle invested by numerous awl-shaped bractlets. The blossoms appear in April or May, with the first leaves, and are often injured by the late frosts; this accounts for the fact that the tree only bears a full crop of fruit at irregular intervals. The leaves are oblong-ovate, taper-pointed, distinctly and often coarsely toothed, and in some districts in continental Europe are gathered before they are injured by the frost, and used for the purpose of filling mattresses, being far superior to straw or chaff in this respect. The fruit is very distinctive in appearance, being a sharply three-sided nut, pyramidal in shape, pointed at the apex and flattened somewhat at the base. The involucre is prickly, coriaceous and splits into four valves, which release the enclosed nutlets, usually two in number.

Michaux[6] states emphatically that there are two distinct species of beech in North America, and the following passages are taken from his article on the beech trees, in the hope that it will be of interest to persons not having access to his admirable work:

---

[6] 1819, North American Sylva, Vol. III, page 18.

In North America and in Europe the beech is one of the tallest and most majestic trees of the forest. Two species are found in Canada and the United States, which have hitherto been treated by botanists as varieties; but my own observations confirm the opinions of the inhabitants of the Northern States, who have long considered them as distinct species, and give them the names of white beech and red beech from the color of the wood. In the Middle, Western and Southern States the red beech does not exist, or is very rare, and the other species is known only under the generic name of beech. White beech is common in New Jersey, Pennsylvania and the country east of the mountains. It is insulated in the forests instead of comprising large masses. The heart-wood in this species bears only a small proportion to the sap-wood, and frequently occupies only 3 inches in a trunk 18 inches in diameter. On the banks of the Ohio and in some parts of Kentucky, where the oak is too rare to afford bark enough for tanning, the deficiency is supplied by the beech; the leather made with it is white and serviceable, though avowedly inferior to that prepared from oak bark.

The red beech is almost exclusively confined to the northeastern part of the United States. In Maine, New Hampshire and Vermont it is so abundant as often to constitute extensive forests. The name is derived from the color of the wood, and not of the leaves. It equals the white beech in diameter, but not in height, as it ramifies nearer the earth, and is more numerously divided. The leaves are slightly larger and thicker, and have longer points. The fruit is of the same shape, but only half the size of the white beech fruit. A more important difference exists in the wood; a red beech 15 to 18 inches in diameter consists of from 13 to 14 inches of heart, the inverse of which is found in the white beech.

The fruit, or "mast," as it is collectively termed, was formerly known in Great Britain as buck, and Buckingham County, England, is named from its fame as a beech-growing country; buckwheat also derives its name from the resemblance of its angular seeds to the fruit of the beech tree.

Beechmast is eagerly sought for as food by pheasants, deer and other wild animals; in late autumn, when the ground lies thickly covered with it, pigs and turkeys are allowed to run wild and fatten upon the mast; the flesh of domestic turkeys allowed to forage in this manner is said to closely resemble wild turkey in flavor. The kernels, when dried and ground into meal, yield a flour of which wholesome bread can be baked; when roasted, they form a tolerable substitute for coffee.[7]

A clear, yellow, inodorous oil is expressed from the mast; the percentage yielded seems to have been confused, by some authorities, with the percentage existing in the fruit, and the variation in the

---

1876, Waste Products and Undeveloped Substances. P. L. Simmonds.

works of different writers in this respect produces confusion in the minds of persons reviewing the subject. The variation in practice is, no doubt, due to the ripeness of the seeds and the degree of pressure employed.

The oil is one of the best-keeping fatty oils known, remaining free from rancidity for twenty years or longer.[8]

In the reign of George I, of England, a petition was presented, praying letters-patent for making butter from beech nuts. A beech oil company was one of the noted speculations of Queen Anne's reign,[9] and large corporations are now in existence in continental Europe, whose object is the production of the oil.

One very old reference to beech nuts is as follows: "The mast or seeds yield a good oil for lamps, and are a very agreeable food to squirrels, mice and swine. The nuts, when eaten by human persons, occasion giddiness and headache, but when dried and powdered make a wholesome bread. They are sometimes roasted and substituted for coffee. The poor people in Silesia use the expressed oil instead of butter."[10]

The oil is obtained by expression, either hot or cold; after the nuts have been freed from dirt and leaves they are ground with a certain proportion of water to form a paste, which is placed in a canvas bag and submitted to pressure for several hours; the paste is then removed from the press and again ground up with a smaller proportion of water than before, and, after warming slightly, it is submitted to pressure a second time. The cold pressed oil, sometimes called "virgin" oil, is somewhat thin, bright yellow, odorless, and of a mild taste. The specific gravity varies from 0·920 to 0·930, according to different authorities, although the figure most frequently quoted is 0·9225, the earliest mention of which was found in 1838.[11]

At one time beech nuts were supposed to contain a narcotic principle, and the press cake was reputed to have a deleterious effect upon horses or cattle, but was used for feeding hogs and poultry;[12] this principle was made the subject of several investigations and

---

[8] 1889, Bornemann, Die Fetten Oele.

[9] 1876, Waste Products and Undeveloped Substances. P. L. Simmonds.

[10] 1796, Enclycopædia Britannica.

[11] 1838, Berzelius, Lehrbuch der Chemie, Vol. VI, p. 501.

[12] 1894, National Dispensatory.

was named fagin. The method given for its preparation consisted in making an emulsion of the oil-freed seeds with water and evaporating it to dryness with calcium hydrate;[13] extraction with alcohol and subsequent purification yielded the principle which dissolved in water with a yellow color, and formed crystallizable salts with sulphuric acid. Büchner and Herberger[14] had already investigated the kernels, which had been reported to contain hydrocyanic acid; after a thorough examination they failed to find any hydrocyanic acid, but mentioned the presence of a coniine-like, volatile alkaloid. The presence of this reputed narcotic principle seems to have remained unquestioned for a number of years, until Brandl and Rakowiecki[15] made a thorough investigation of the kernels, which were successively treated with ether, alcohol, cold and warm water and hydrochloric acid. They found, among other substances of minor importance, 45 per cent. of fixed oil, 3 per cent. of starch, albuminoids, gum, resin and a volatile alkaloid. Further examination of the last-named substance led to its identification as trimethylamine. The fatty oil, according to them, consists principally of oleic acid, with a little stearic and palmitic acids, in combination with glycerin. Their conclusions in this respect have been upheld by subsequent investigations.

According to Schaedler[16] the shelled beech nuts contain, in 100 parts: Oil, 21·26; organic substances, 64·12 (including 24·00 parts albuminous matter); ash, 4·12; moisture, 10·50.

The warm pressed oil has a sharp acrid taste, which disappears after standing, and which can be removed by shaking with cold water and subsequent separation. The oil is an excellent burning oil, and is equal to olive oil for culinary purposes. It is sometimes used as an adulterant of almond and olive oils; saponifying easily it yields a whitish soap of soft consistence, which turns yellow and eventually greenish.

In spite of its manifold uses and comparative ease of expression, the demand is always in excess of the supply in regions where it is produced; this is due to the fact, previously mentioned, that the

---

[13] 1838, Berzelius, Lehrbuch der Chemie, Volume VI, p. 501. 1837, Zanon, Arch. der Pharm., Vol. II, p. 213.

[14] 1836, Büchners Repertorium, 57, p. 57.

[15] 1865, Chem. Centralblatt, 36, p. 143.

[16] 1883, Technologie der Fette und Oele.

trees do not bear a full crop every year, consequently permanent establishments for its production can only be maintained in the vicinity of large forests.

The majority of writers upon the subject of the fatty oils class this among the non-drying oils; Allen, however, places it in the cotton-seed oil group among the semi-drying oils, the latter supposition is confirmed by the author's experience with the oil prepared from American beech nuts, as it possessed unmistakable drying properties. The following experiment was performed to test its drying properties, with the accompanying results. 0·764 gramme were exposed on a watch-glass for ten days, the temperature being raised several times by placing it on the water-bath for an hour; after one day it had gained 0·78 per cent. in weight; after two days, 1·17 per cent., and at the expiration of ten days the gain was 3·79 per cent. After exposing about 25 grammes to the heat of a water-bath for four or five days, the oil acquired the characteristics of a blown oil, possessing an acid reaction and a high specific gravity.

The beech nuts examined by the author were gathered in Sullivan County, Pennsylvania. The beech trees in this particular locality are associated with hemlocks; but as the latter are being cut out for the purpose of supplying the tanneries in the vicinity, the beech already predominate.

The weight of 100 average nuts was 28·60 grammes, containing 10 per cent. of imperfect or worm-eaten nuts. The weight of 100 sound, selected nuts averaged 33·15 grammes. The percentage of weight of the husks in the latter was 36·52, the percentage of kernels being 63·48.

The moisture was determined by drying 5 grammes of the nuts, previously powdered with glass, to a constant weight on a water-bath. The average of three determinations was 6·01 per cent.

The ash was estimated by incinerating a small quantity of the powdered kernels in a platinum crucible, the average of three determinations being 3·27 per cent.

The nitrogen was estimated by the Kjeldahl method. Two grammes of the kernels yielded enough ammonia to neutralize 4·73 c.c. of normal sulphuric acid, corresponding to 4·02 per cent. of nitrogen. This is equivalent to 25·13 per cent. of albuminoids when calculated in the usual manner, using 6·25 as the factor.

Reducing sugar was tested for with negative results; 1·5 grammes

of the powdered kernels were then boiled for some time with diluted hydrochloric acid, with a reflux condenser, to invert the starch which was present. The reducing sugar which resulted from the inversion was estimated volumetrically by means of Fehling's solution, and yielded 3·89 per cent., corresponding to 3·5 per cent. of starch.

Specific Gravity.	Per cent. of oil in unshelled seeds.	Per cent. of oil in kernels.	Saponification number.	Iodine number.	Congealing point Degrees C.	Authority.
0·9225	11–25*	20	—	—	—	1838, Berzelius, Lehrbuch der Chem.
0·9207 (Le Febre)	—	—	—	—	—	1866, Gmelins' Handbuch.
0·9200	18–45*	—	—	—	—	1875, Fehling's Handwörterbuch.
0·9210 to 0·9230	—	—	—	—	—18	1882, Allen, Com'l Org. Anal.
0·9225	12–15	20	—	—	—16·5,—17·5	1883, Schaedler, Tech. der Fette u. Oele.
0·9200	—	—	—	—	—15	1887, Hager, Pharm. Praxis.
	12–15	—	—	—	—	1888, Brannt, Animal and Vegetable Fats and Oils.
0·9200 to 0·922	12–15	20–25	—	109	—17·5	1889, Schmidt, Pharm. Chem.
0·9200 to 0·9225	12–16	—	—	—	—16·5,—17·5	1889, Bornemann, Die Fetten Oele.
0·9225 (Chateau)	—	—	196·25	(Gir'd) 104·4	—17·5	1892, Benedikt, Analyse der Fette.
0·9200 (Souchen)	—	—	—	—	—	1892, Benedikt, Analyse der Fette.
0·9225 (Schübler)	—	—	—	—	—	1892, Benedikt, Analyse der Fette.
0·9205 (Massu)	—	—	—	—	—	1892, Benedikt, Analyse der Fette.
0·9220 (De Negri & Web) .	—	—	191·1	111·2	—	1895, Benedikt, Analyse der Fette. Translated by Lewkowitsch.
0·9220	—	—	—	—	—17·5	1892, Prescott, Org. Analysis,
0·9210 to 0·9230	—	22	—	—	—17·5	1894, National Dispensatory.
	27–29	43–45	—	—	—	1895, A. Wright, Oils, Fats. Waxes and Mfg. Products.

* The figures indicated in this manner do not indicate whether the seeds are shelled or unshelled.

The fixed oil was estimated by extraction with pure anhydrous ether in a Soxhlet extraction apparatus; five determinations were made, weighing the residue after each extraction to check the results. The average of the five determinations was 52·84 per cent. of fixed oil. This was in the dried material, and is equivalent to 30·65 per cent. in the average nuts in the unshelled condition. The oil extracted by ether was dried on the water-bath for several days, to a constant weight, and then examined for comparison with the European oil, but its drying properties had caused it to assume characteristics far from normal. It possessed a specific gravity of

0·985, an acid number of 23·43, and a saponification number of 229·52.

A small quantity of oil was obtained by cold expression, so that a normal sample could be had for examination. The properties of the oil prepared in this manner corresponded very closely to those reported for the European oil. The expressed oil was of a pale yellow color, mild, nutty taste and neutral reaction. The specific gravity was 0·9216 at 15° C.; the saponification number was 195·02. The saponification numbers were, in all cases, accompanied by blank experiments for correction.

The table on previous page has been prepared, making comparisons of the work of many investigators of the subject.

RHUS POISONING.

By George M. Beringer.

This has been the subject of a number of interesting communications published in the *Garden and Forest*. From a pharmacological standpoint they are valuable and interesting. The present writer, being very susceptible to the influence of this poison, is able, from personal experience, to confirm some of the statements made therein.

J. W. Harshberger[1] considers Rhus toxicodendron as poisonous in all seasons of the year, stating that poisonous effects have been experienced in January. He believes its action, however, to be most severe in August and September.

D. P. Penhallow[2] states that the poisonous principle is more or less common to the entire family, and states that in opening an old "marking nut," Semecarpus anacardium, "I was subjected to the effects of the black, varnish-like latex in the interior, which were those of our common Rhus Toxicodendron." He also reports serious poisoning resulting from stirring and smelling the Japan lacquer made from Rhus vernicifera. He states that "after a few experiences it was always possible to ascertain whenever I came into an atmosphere charged with the poison. This was manifested by a well-defined acid taste in the mouth and a slight somewhat acute

---

[1]*Garden and Forest*, June 12, 1895, p. 239.

[2]*Garden and Forest*, September 4, 1895, p. 359.

pain directly between the eyes. These were invariably symptoms of the results to follow." The Japanese employ, as a treatment, the flesh and juices of a fresh giant spider crab, Macrocheira Kæmpferi, applied freely to the parts. He recommends free applications of a solution of sodium hyposulphite, ½ ounce; glycerin, 3 ounces; carbolic acid, 60 drops; water, 10 ounces.

Prof. C. S. Sargent[3] considers that the Rhus Michauxii, a rare shrub of North Carolina and Georgia, is the most poisonous of the North American species of Rhus.

E. G. Lodeman[4] writes of his personal experience, and states that the disease reappeared in his own case in childhood for six years, consecutively, about the same time after being poisoned, and without subsequent exposure to the plants. An attack of typhoid occurred in the seventh year, and he then escaped the disease for several years until, thinking himself exempt from the influence, a part of a leaf was rubbed on the back of the hand, and again for several years the recurrence of the disease at the same period occurred. He reports, as a painful concommitant of ivy poisoning, the appearance of boils after each attack, and the more severe the poisoning the greater the number.

Prof. T. J. Burrill[5] again directs attention to his statement made in 1882, attributing the poisonous properties of Rhus to the action of bacteria, but admits that the particles in the latex of the plant, first mistaken for micrococci, are constituents of the latex. While he admits that proof of the bacterial character of the poisoning must be considered as wanting, the apparent period of incubation and activity of the exudation are thought to be arguments in favor of the bacterial theory of cause.

This writer has evidently overlooked the investigations of Prof. J. M. Maisch, in 1865,[6] which proved conclusively that the poisonous action was due to a peculiar volatile acid, which he named *Toxicodendric acid.* The later arguments advanced in favor of the bacterial origin theory might, with equal force, be applied to such vesicants as cantharides, mustard and croton oil.

---

[3] *Garden and Forest*, October 9, 1895, p. 404.

[4] *Garden and Forest*, October 2, 1895, p. 398.

[5] *Garden and Forest*, September 11, 1895, p. 368.

[6] AMERICAN JOURNAL OF PHARMACY, 1866, p. 4.

In April, 1883, the writer was severely poisoned in the Odd Fellows' Cemetery, Philadelphia, by handling some poison-ivy on which the new leaves were just appearing. Although the hands were protected by gloves, and the exposed portions, face and hands, were shortly after washed, nearly the entire surface of the body suffered, the face and eyelids being so swollen as to nearly produce blindness. Following this attack came a series of boils, and for several years afterward, about the same time, there appeared the characteristic eruption and sensations when there had been no contact or exposure to the plant.

By carefully avoiding too close acquaintance with the genus Rhus, I escaped with but very slight punishment for a number of years.

In the early part of May, 1894, unfortunately, while in profuse perspiration, I stopped to take up a few violets for my herbarium, and, in doing so, disturbed some vines and roots of the poison-ivy. This was sufficient, however, as a severe attack of poisoning resulted. During the following months, on merely passing by the plants the effects were experienced in a moderate degree. In September of the same year, passing by some Rhus Toxicodendron in fruit at Haddonfield, N. J., the effects were again experienced, and still later in November, near Merchantville, N. J. I came across the upright variety with fruit well developed and leaves fallen, and face and hands were again poisoned. During the summer and fall of 1894, the acquaintance with Job's torments was again renewed, a series of boils adding again to the discomforts of rhus poisoning.

It is now pretty generally admitted that all parts of the Rhus Toxicodendron are poisonous, and at all seasons of the year. In my own experience I have observed that the dust shaken from the roots is likewise capable of causing the irritation wherever it comes in contact with the skin. It is popularly believed that persons of a blonde complexion are far more susceptible to its influence.

During the past summer, washing the face and hands with solution of hydrogen dioxide has been adopted as a preventive, with apparently good results. Hot soda baths have also appeared to be efficacious in the treatment of the disease, and, for a topical application, I prefer the following lotion :

℞ Sodium sulphite granular	1	drachm.
Glycerin	½	fluid ounce.
Camphor water q. s. ad fac.	4	fluid ounces.

PINUS STROBUS, L.

A CONTRIBUTION TO THE KNOWLEDGE OF SOME NORTH AMERICAN CONIFERÆ.

BY EDSON S. BASTIN AND HENRY TRIMBLE.

INTRODUCTORY.

It is the intention of the authors to contribute a series of articles on the botany, histology, chemistry and economics of our most important cone-bearers. While a portion of the work will necessarily be compiled, it is proposed that the most of it shall be the results of original research. No attempt will be made, however, to exhaust the subject, but we hope to develop and indicate lines of investigation, to be followed up either by others or by ourselves. Probably no large family of plants in this country has received so little attention at the hands of the microscopist and chemist as this one, and the authors hope, by studying one or more typical species in each genus and publishing the results, to be able to materially add to the knowledge of the whole order. It is possible that a strictly logical order of treatment cannot be followed, on account of the difficulty sometimes experienced in procuring the proper specimens at the right time.

In a few cases, we have specimens of coniferous barks from foreign countries, and we shall digress from the title of the paper far enough to consider them along with their nearest relatives in this country. A few foreign representatives, which, by cultivation for ornamental purposes, have practically become naturalized here, will also be considered in their proper places.

GENERAL CHARACTERS.

The Coniferæ may be described as freely branching trees or shrubs, which resemble most dicotyls in possessing tap-roots, and in having monostelic stems containing radially arranged, open, collateral bundles, separated laterally by medullary rays, and growing in thickness by means of a closed cambium zone. The wood, however, differs from that of nearly all dicotyls and other angiosperms in the absence of proper vessels, consisting chiefly of tracheids, which are prominently marked by bordered pits. The leaves are commonly, though not in all species, evergreen and needle-like, awl-shaped, arcuate or scale-like, rigid, simple-veined and without stipules, and usually also without petioles. The flowers are always destitute of a proper perianth and are very simple in their structure, and always separated into staminate or microsporangiate and pistillate or macrosporangiate kinds. The two kinds are usually borne on the same

individual plant, but sometimes, as in the juniper and yew, they are borne on separate individuals.

The sporangia are commonly borne on sporophylls, but sometimes, as in the macrosporangia of the yew, they are terminal on the branches. The microsporangiate flowers usually consist of numerous microsporophylls, compactly arranged either in whorls or spirals, in a cone-like cluster on a slender axis. The microsporophylls are usually scale-like, short-stalked and somewhat peltate, often with the connective continued beyond the sporangia. Each sporophyll bears, according to the species, from two to as many as eighteen sporangia. The latter mostly dehisce longitudinally. The pollen or microspores are frequently multicellular, sometimes globose, but more commonly provided with an opposite pair of turgid, vesicular appendages, outgrowths from the extine. The pistillate or macrosporangiate flower is also usually a cone, and consists of a number of open carpellary scales imbricated on an elongated axis, and bearing the naked ovules or macrosporangia on their upper surfaces. The number of ovules on each scale varies from one to as many as seven.

The yews are exceptional in the fact that there is no macrosporophyll, but the macrospore is borne on the cup-shaped end of the axis.

The macrosporangium usually has a gaping micropyle, and often also the endostome is prolonged into a styloid tube.

The flowers are always wind pollinated.

The fruit is most commonly a dry strobile, but is sometimes a drupe-like or a berry-like galbulus.

The seed is often winged, is always albuminous and the albumin may be oily, fleshy, fleshy-farinaceous, horny, or rarely ruminate. The embryo is straight and axile, the cotyledons, which in different species may vary from two to fifteen, are always whorled and equal, and the germination is nearly always epigæal.

CLASSIFICATION AND DISTRIBUTION.

The order includes, about 350 species, grouped into two sub-orders, the *Pinoideæ* and the *Taxoideæ*.

SUB-ORDER I.

The Pinoideæ include by far the greater number of species. They are the true cone-bearers, the pistillate flowers being cones and

developing into dry strobile-fruits. The seeds have a woody or leathery testa, no aril are attached until ripe to the upper surface of the macrosporophylls or to the placental scales borne by them, and are dispersed by the wind after the scales have diverged to set them free.

The sub-order is divided in the following families:

FAMILY 1.—*The Araucarieæ,* mostly southern hemisphere trees of pine-like aspect. They are characterized by diœcism, by wingless pollen-grains, and by simple one-seeded fruit scales. Here belong the genera Dammara (Dammar trees) and Araucaria. Four species are well known, Dammara australis, Araucaria brasiliana, A. imbricata, and A. excelsa.

FAMILY 2.—*The Abietineæ.*—These are mostly natives of the temperate and colder portions of the northern hemisphere. They are characterized by cone-scales which are not simple, but double; that is, on the upper surface of one scale, near its base, is borne another, usually a larger one, called the placental scale. To this, near its base, are attached two ovules, each with its micropyle pointing toward the base of the scale. The species are all monœcious. Their pollen grains bear an opposite pair of bladdery expansions, outgrowths of the extine.

The following are the genera:

(*a*) *Abies, the Silver Firs.*—Their branches are whorled and there are no dwarf shoots. Their foliage leaves are flattened and marked on the dorsal surface with two parallel white lines. The fruit is an erect cone, bearing flat placental scales; it matures in one year from pollination, and the scales fall away from the axis to shed the seeds when ripe. The two kinds of scales are nearly equal.

Here belong A. balsamea and A. Fraseri (the balsam firs), A. pectinata (the silver fir), A. Pinsapo, from Spain, A. Nordmannia, from the Caucasus, A. cephalonica, from southeastern Europe, A. amabilis, A. magnifica, and other species from western America.

(*b*) *Picea, the Spruces or Spruce-Firs.*—The species differ from those of Abies in having four-angled foliage leaves which are decurrent, and form ridges on the branches; in having pendant fruit-cones, which fall entire when ripe, and in having the placental scales much larger than the microsporophylls. The leaves possess two lateral resin ducts. The following are examples: P. excelsa (Norway spruce), P. alba (white spruce), P. nigra (black spruce), and P. pungens (blue spruce). The last three are North American species.

(*c*) *Tsuga, the Hemlocks, or Hemlock Spruces.*—These have flat foliage leaves, which are whitened beneath, and disposed horizontally in two rows. The midrib stands out prominently on the lower surface, and is correspondingly depressed on the upper. The staminate flowers in nearly globose clusters; the pollen-sacs dehiscing transversely. The fertile cones mature the first year, are pendulous on the branches, and the scales are thin and persistent. T. Canadensis is our Eastern hemlock, whose bark is so much employed in tanning. T. Mertensiana and T. Pattoniana are West American species, and T. Sieboldii is a Japan species.

(*d*) *Pseudotsuga, the False Hemlock Spruces.*—Leaves flattened, short-petoliate; macrosporangiate scales much longer than the placental ones, thin and three parted; microsporangiate flowers large, and borne in the axils of last year's leaves; flower and leaf-buds very large.

P. taxifolia (the Douglass spruce), and P. macrocarpa (the big-cone spruce) are both West American.

(*e*) *Larix, the Larches.*—The members of this genus differ from all the preceding Abietineæ, in having both long and short shoots, on which the leaves are borne; leaves on the short shoots fascicu-lately arranged, and on the long shoots spirally, deciduous in the autumn; branches not whorled; both staminate and pistillate flowers terminal on short leafy shoots; cones pendent and maturing in one season. Examples are: L. Americana (the American larch or tamarack), L. Europæa (the European larch, commonly cultivated), L. occidentalis and L. Lyellii, West American species.

(*f*) *Cedrus, the True Cedars.*—They have the general aspect of the larches, but have evergreen leaves, and require two years to develop their seeds. The cones are large, erect and depressed at the ends. There are three species, all oriental: C. Libani, C. Atlantica and C. Deodara.

(*g*) *Pinus, the Pines.*—The leaves needle-like, evergreen, in fascicles of from two to five, with a basal sheath composed of scales; branches falsely whorled; the microsporangiate scales compactly arranged in cones and taking the place of dwarf shoots at the base of a long shoot of the same season; the conical, globose, oblong or cylindrical fruit cones ripening in two years, and bearing thick, usually woody, placental scales, which are expanded at their free ends into a flattish surface or apophysis.

In all, seventy-seven species are known. These are grouped into two sub-genera, that of *Strobus*, or soft-wood pines, and that of *Pinaster*, the hard-wood or pitch pines.

In the sub-genus Strobus the leaves are usually in fascicles of five, the sheaths are loose and deciduous, with an apophysis that is thin and with the umbo at its upper end devoid of a spine. Resin ducts in both wood and bark, but the resin less abundant than in the members of the other sub-genus. Here belong P. Strobus (our white pine), P. excelsa (Himalayan), P. Cembra (stone pine of eastern Europe and northern Asia), P. parviflora, of Japan, and P. Lambertiana, P. monticola, P. flexilis and P. albicaulis, all West American species.

In the sub-genus Pinaster the leaves are mostly in twos or threes, but sometimes in fives, the apophysis is thickened and bears a dorsal ridge, and the umbo is usually terminated by a spine or prickle, the sheaths also are more persistent. The wood is harder, darker colored and more resinous.

Examples are: P. sylvestris (Scotch pine), P. Pinaster, P. Laricio, P. Montana, P. Pinea—all European; P. Taeda, P. Banksiana, P. pungens, P. inops, P. rigida, P. mitis, P. resinosa and P. palustris, of the Eastern United States; and P. Balfouriana, P. aristata, P. monophylla, P. edulis, P. Parryana, P. cembroides, P. contorta, P. Murrayana, P. ponderosa, P. Jeffreyi, P. latifolia, P. Apacheca, P. Torreyana, P. Coulteri, P. Sabiniana, P. radiata, P. attenuata, P. muricata and P. Chihuahuana—all West American species.

FAMILY 3.—*The Taxodiniæ, the Taxodiads.*—Trees of large size; monœcious; leaves scale-like or linear, arranged in spirals; microsporophylls bearing from two to eight sporangia; possessing placental as well as macrosporophyll scales; cones globular or oblong, woody, maturing in one season.

There are several genera, including the Sequoia, of California; Sciadopitys and Cryptomeria, of Japan; Cunninghamia, of China, and Arthrotaxis, of Tasmania—all of which are evergreens; and Taxodium (including the bald cypress of the Southern States) and Glyptostrobus, native to southern China—both of which are deciduous leaved.

FAMILY 4—*The Cupressineæ, the Cypresses.*—Wood more or less pungently aromatic; leaves small and scale-like or awl-shaped, always in whorls, the leaves and cone scales either opposite or in

threes. Most of the species monœcious, but a few diœcious; the fruits, except in the genus Cupressus, requiring but one year to mature.

They are mostly trees of slow growth, many of them natives of Asia and Australia.

Thuya (Arbor-vitæ), Libocedrus, Chamæcyparis, Cupressus and Juniperus, each have their representatives in the United States; while Thuyopsis, Biota, Actinostrobus, Callitris and Fitzroya are oriental genera.

The Junipers differ from the other members of the group, in the fact that they are diœcious, and in the fact that the fruits are fleshy and berry-like or drupaceous, because the cone-scales become coalescent and succulent in the process of ripening.

SUB-ORDER II.

THE TAXACEÆ.—*The Yews and their Congeners.*—Macrosporangiate flowers not commonly cones. The macrosporophylls either absent or rudimentary, or at least less developed than in members of sub-order I; the seed usually projecting beyond the macrosporophyll, when the latter is present and partly enclosed in a succulent arillus. The flowers are diœcious, and the leaves are evergreen.

The great majority of the group, which number, about ninety species, are Old World or southern hemisphere forms. Taxus Canadensis, T. brevifolia and Torreya Californicum are the American species.

Salisburia, Cephalotaxus, Microcachrys, Podocarpus, Dacrydium, and Saxegothea are other genera, mostly belonging to the Old World.

CHEMICAL COMPOSITION.

The constituents of the plants in this natural order have been but imperfectly studied. Volatile oils, resins, tannin and coniferin are the best known, and all but the last were known and used for their economic value long before any investigation was made of their chemical properties. In the old world, where the oleoresinous products have been used from time immemorial, comparatively little has been done to establish their true chemical composition. It is only in recent years that the terpenes have been successfully investigated. A large number of less important compounds have been noted in the conifers of the Old

World, notably small quantities of organic acids. No doubt, these same compounds will be found more or less widely distributed in the representatives of the order growing in this country. Resin appears to be especially abundant in the pines, and as turpentine, and its two products, oil of turpentine and rosin, it is the basis of one of the largest industries in America. Only a few species, however, yield the so-called gum in paying quantities—in North America it is chiefly Pinus palustris, and in Europe Pinus sylvestris and P. Laricio, which are the chief sources. At least one species, Pinus Lambertiana, exudes a substance which, in physical properties, resembles the sugars.

Abies balsamea yields the well-known Canada balsam, or balsam of fir, and Venice turpentine is obtained from the European larch—Larix Europæa.

Burgundy pitch is another product of the cone-bearers. The Pharmacopœia directs the use of that from the European Abies excelsa. Tar is a product from many species in both continents; in this country it is usually obtained by the destructive distillation of Pinus palustris. Chemically considered, all of the foregoing resinous and oleoresinous substances are made up of a number of compounds.

Tannin is found in the bark of nearly all the members of the order, but only that from a few species is of industrial importance. In Europe a tanning extract is made from the bark of a number of the larches, while in this country Tsuga Canadensis furnishes a creditable proportion of all the material used.

In the bark of many of the species considerable proportions of mucilage exist, sufficient in some of the firs to cause the infusion of their barks to become viscid.

ECONOMICS.

The Coniferæ must rank among the most useful of the natural orders of plants. In the production of food materials, they are, of course, far outranked by the Graminaceæ and by some other natural orders, though several species of the genus Pinus produce great quantities of edible seeds that have been much used for food by the Indians of Western America, and are beginning to be better appreciated by the whites. In the yield of valuable timber, however, the Coniferæ easily stand first. Within the order, the genus Pinus is, for this form of production, much the most important. This is due to the vast numbers and the size of the trees, and to the workable

quality and the durability of their timber. But of great value, also, are the sequoias, especially sempervirens, the junipers, thuyas, cedars, chamæcyparids, spruces, firs, hemlocks, podocarpids and yews. Some, as Juniperus Virginiana and Taxus baccata, furnish timbers of exceeding durability. The species of Abies furnish wood which is most valuable for the manufacture of wood pulp. The bark of the hemlock spruces is of immense value in the tanning industry, and it is not improbable that other species of Coniferæ may prove quite as useful in the same way, when sufficiently investigated. The order is also the most important of all the natural orders of plants, in its yield of resinous and oleoresinous products. Burgundy pitch, Canada pitch, balsam of fir, Venice turpentine, ordinary turpentine, rosin, oil of turpentine, retinol, fir wool oil, oil of savin, oil of juniper, tar, and several other valuable products being obtained from the order.

PINUS STROBUS, L.

WHITE PINE, WEYMOUTH PINE.

GENERAL CHARACTERS.

In this paper *Pinus Strobus*, Linné, has been studied as the type of the soft-wood section of the genus to which it belongs. It is the principal timber pine in the great pine regions of the Northern United States, from Minnesota eastward to the coast, and in Canada. It is a straight-boled tree, and under favorable conditions attains a height of 175 feet, and a trunk diameter, at the distance of 4 feet from the ground, of 5 feet. Its leaves, in fascicles of five, are very slender, about 3 inches long, with two flat and one convex side, on each of the flat sides are two, or sometimes three, whitish lines on the otherwise deep green surface, the lines running lengthwise and parallel to each other from base to apex of the leaf. They are the rows of stomata, the latter being confined to the two flat surfaces. The two angles formed by the convex surface with the flat ones are roughened by minute distant serrulations.

The staminate flowers are one-third of an inch, or a little more in length, subtended by six to eight involucral scales at the base; the fertile flowers are cylindrical and on rather long peduncles; the fruiting cone is pendant, cylindrical, or often somewhat curved, and frequently 6 inches in length, but averages nearer 5; its scales are but slightly thickened at the apophysis and are smooth.

The branches and younger portions of the trunk are smooth-barked, the wood is light, soft and easily worked, being less resinous than that of most other species of its genus.

MICROSCOPICAL STRUCTURE.

Sections of the stems of various ages, of roots showing two or three rings of growth, and of the leaves, were made and tested in various ways.

Sections of twigs of various ages were tested for tannic matters, the following reagents being employed on different sections: Aqueous solution of ammonio-ferric alum, solution of ammonium molybdate, solution of potassium bichromate, solution of osmic acid, and solution of anhydrous ferric chloride in absolute alcohol. The latter reagent was chiefly relied upon, the other tests being used as confirmatory.

It was found that the tannin is of the variety that gives a green precipitate with ferric solutions, although the freshly cut sections showed a blue-black color, due to some accompanying compound. It pervades the protoplasm (1) in many cells of the cambium zone; (2) in numerous large, parenchymatous cells of the bast layer; (3) in numerous parenchymatous cells throughout the cortex; (4) in the two or three circles of granular cells surrounding the resin ducts in the cortex; (5) in many of the collenchyma cells beneath the periderm; (6) in many cells of the phellogen and young cork, and, accompanied by coloring matters, in many of the mature cells of the periderm; (7) it also occurs in many of the parenchyma cells of the pith; (8) the younger tracheids next the cambium zone contain a little; (9) some of the medullary ray cells of the xylem contain a little; and (10) there is a little, also, in some of the secreting cells surrounding the resin ducts in the xylem. As a whole, though, the xylem tissues contain but a small proportion of tannin as compared with the tissues exterior to the cambium zone. Studies of older stems gave like results.

Similar results were obtained from the study of sections of the root, except that it was found that the root is relatively richer in tannin. More was found in the medullary rays in the xylem, and more in the secretion cells about the resin ducts in the xylem, than in the stem; but here, as in the stem, the xylem tissues contain little as compared with the bark.

The distribution of tannin in the leaves was also studied, with the

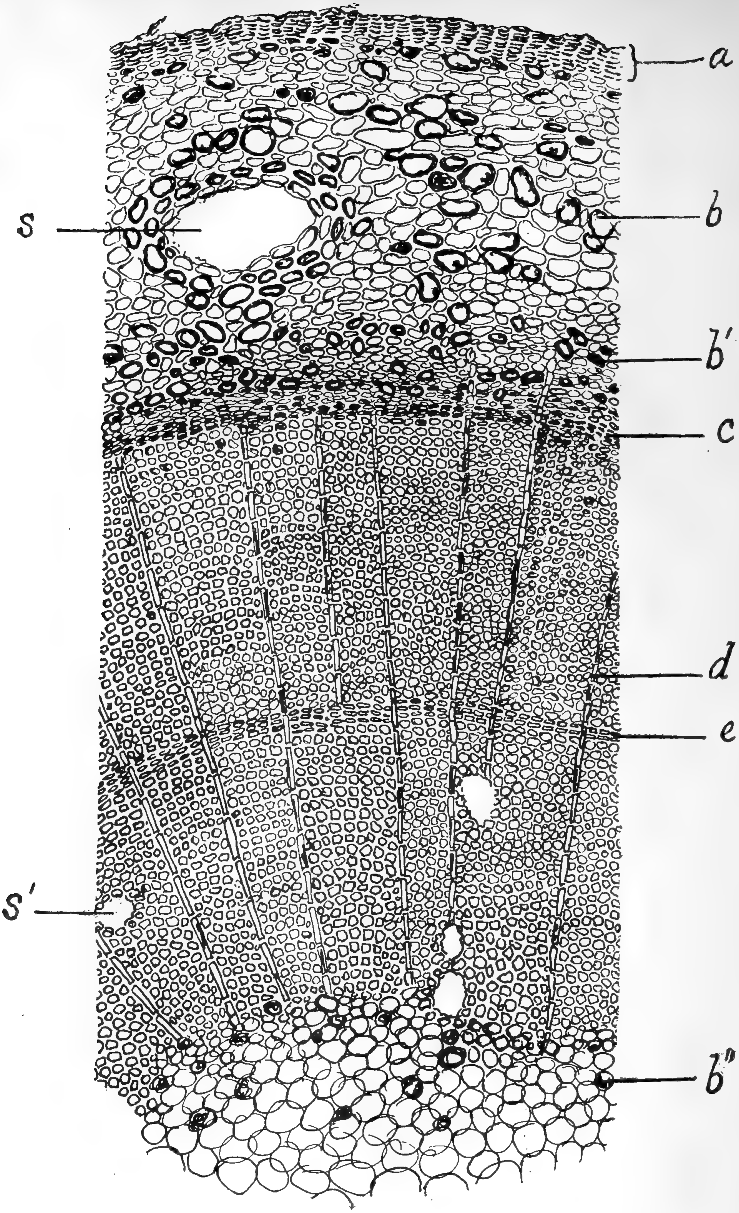


Fig. 1, cross-section of the stem of Pinus Strobus (two years' growth), showing the distribution of tannin. Section drawn as it appears after applying solution of anhydrous ferric chloride in absolute alcohol. The cells shaded dark are those which contain tannin. Magnification, 100 diameters; *a*, periderm (cells mostly containing tannin and coloring matter); *b*, tannin cell in cortex; *b′*, *b″* other tannin cells; *c*, cambium zone containing many cells rich in tannin; *d*, medullary ray, showing tannin in some of its cells; *e*, ring of growth; *s*, secretion reservoir in cortex; *s′*, secretion reservoir in xylem.

following results: tannin occurs in large quantity in many of the mesophyll (folded parenchyma) cells, in smaller quantity in most of the other cells of the same tissue, and apparently not at all in a few of them. In the endodermis and pericycle tissue (transfusion tissue),

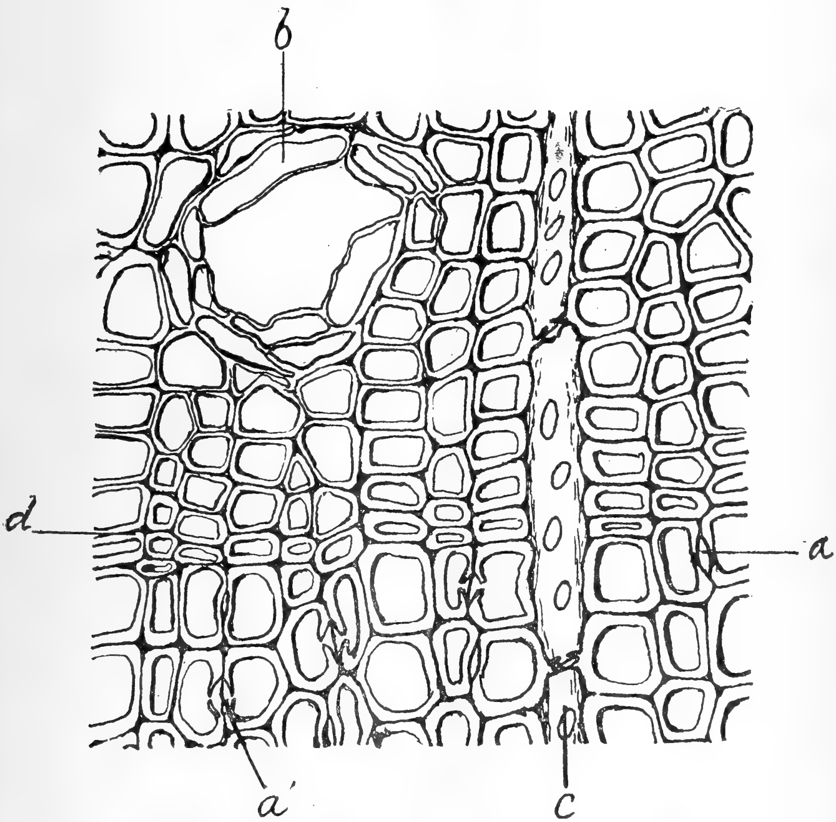


Fig. 2, small portion of xylem of stem of Pinus Strobus, showing tracheids and a secretion reservoir in xylem; *a*, *a'*, bordered pits; *b*, a secreting cell bordering a secretion reservoir; *c*, medullary ray composed of radially elongated cells; *d*, ring of growth. Magnification, 500 diameters.

little or none was observed, but in the phloem and other soft tissues within the pericycle, it occurred in abundance in the protoplasm.

It should be stated that all of the tests for tannin were made upon fresh sections cut from the living plant, and that the test solution was applied to the sections immediately after cutting them. The

results obtained must, therefore, represent, with a fair degree of acccuracy the distribution of tannin in the living tissues.

Both the bast and cortical regions of the stem abound in cells containing mucilage. These cells are usually larger in transverse

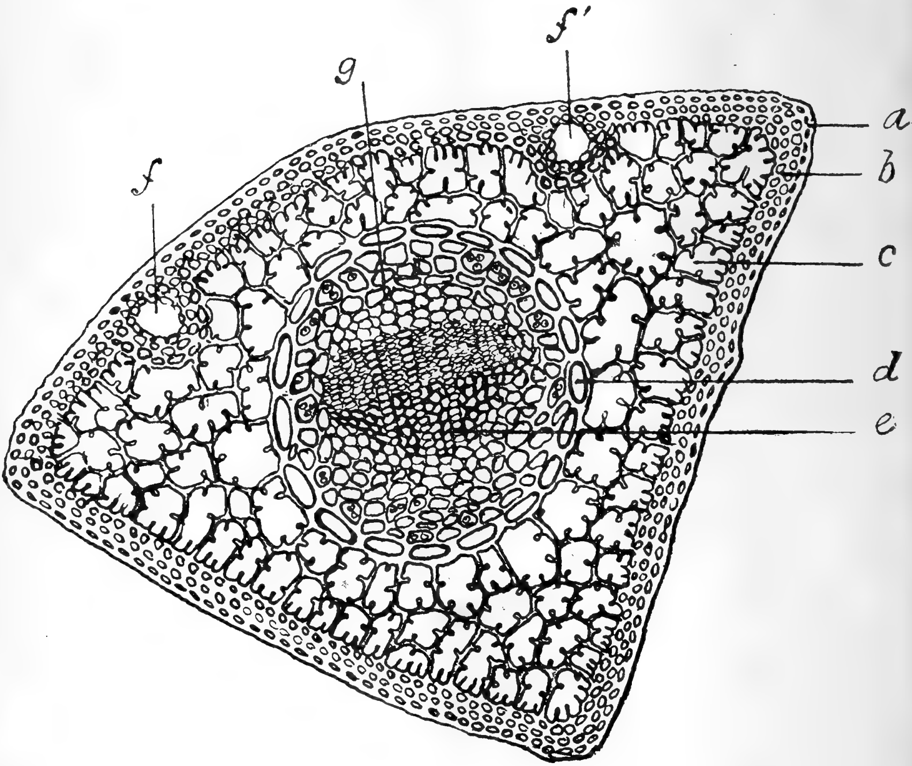


Fig. 3, cross-section of leaf of Pinus Strobus magnified 150 diameters; *a*, epidermis, composed of very thick-walled, lignified and cutinized cells; *b*, hypoderma, composed of lignified and thick-walled fibres; *c*, mesophyll cell, showing folds in the cell wall; *d*, endodermis, enclosing a single collateral bundle; *e*, xylem of the bundle; *f*, *f'*, secretion reservoirs; *g*, pericycle, consisting of numerous thin-walled and short tracheids containing pits in their walls similar to those in the walls of the tracheids of the stem and root (the so-called "transfusion tissue").

view than the cells with which they are associated. Most of them also contain tannin, and many of them oleoresinous matter besides.

The alkannin test showed that oleoresin is not confined, by any means, to the secretion reservoirs, or to the two or three circles of cells immediately surrounding them, but occurs also in many of the parenchymatous cells of the cortex and bast layer, in the medullary-ray cells that cross the xylem, in a few of the tracheids of the xylem, and in many of the parenchyma cells of the pith.

Considering the xylem cylinder as a whole, however, it contains far less oleoresinous matter than the tissues exterior to the cambium zone.

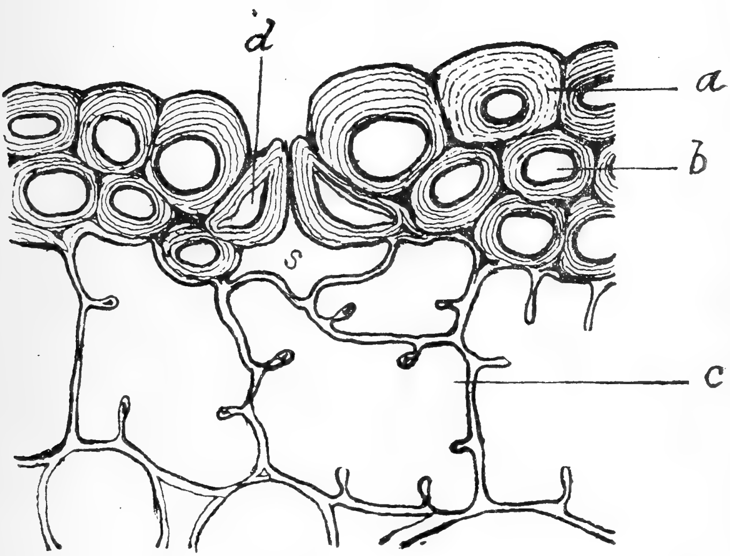


Fig. 4, small portion of cross-section of leaf of same species, magnified 750 diameters to show stoma; *a*, epidermal cell; *b*, hypodermal fibre; *c*, one of the mesophyll cells, deprived of its granular contents by bleaching solution; *d*, one of the guard cells of a stoma. The sections from which *Figs. 3* and *4* were drawn had been treated with Labarraque's solution to remove the cell contents, and afterwards stained.

A few of the large parenchymatous cells of the cortex were observed to contain crystals. In some instances a single cell would contain great numbers of them, but the crystals themselves were not coherent or massed. No sphere crystals, in fact, were observed. As the crystals slowly disappeared without effervescence when the sections were treated with hydrochloric acid, the conclusion was that they are composed of calcium oxalate.

The starch found was mainly in the cells of the cortex or middle bark. The granules were small and of various shapes, some nearly spherical, others much elongated, ellipsoidal, club-shaped, variously bent, angular, etc. Bi-nucleated or double grains are not infrequent, but the majority are simple. The hilum was usually recognizable, and then appeared as a faint central or sub-central dot, or sometimes as a slight fissure, but no other markings were observed.

The root, when young, has three or four xylem rays within its endodermis, but later on, after secondary changes are well advanced, its histology closely resembles that of the stem, save in the absence of a pith.

Fig. 5, starch from the root of Pinus Strobus, magnified 1,200 diameters.

The figures, with the descriptions which accompany them, will convey an idea of the essential features in the histology of the stem and leaves.[1]

A study of sections of the stem of *Pinus excelsa*, Wall, showed a

[1] *Authorities consulted.*—John Crombie Brown's Monograph on the Pines. Murray's Pines and Firs of Japan. Baillon's Dictionaire de Botanique. Lambert's Work on the Pines. Warming and Potter's Systematic Botany. Vines' Text-Book of Botany. Brewer and Watson's Botany of California. Gray's Manual of Botany. Lemmon's Hand-Book of West-American Cone-Bearers.

structure very similar to that of Pinus strobus, and a similar distribution of tannic matters. The tannin was also of the same variety and apparently about the same in quantity. The leaves and roots were not examined.

CHEMICAL COMPOSITION.

Proximate Analysis of the Leaves.—When treated with absolute alcohol, the fresh leaves readily yielded their green coloring matter to this solvent, which also removed the acid principle to which their

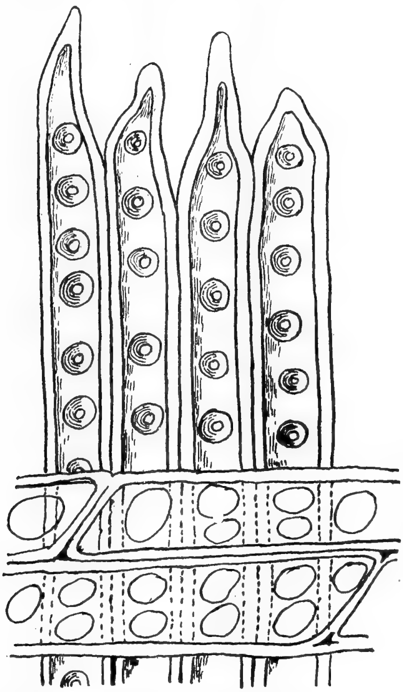


Fig. 6, small portion of longitudinal-radial section through the xylem of the stem, showing portions of four pitted tracheids and some medullary ray cells magnified 400 diameters.

As in most gymnosperms, the bordered pits are mostly confined to the radial walls of the tracheids.

sour taste is due. The total amount removed by absolute alcohol was 18·83 per cent. When this extract was treated with water, an amount of it equal to 8·74 per cent. of the leaves was dissolved. This aqueous solution had a strongly acid reaction, and gave pre-

cipitates with lead acetate, ferric chloride and bromine water; the last two reagents indicated a tannin like that found in oak bark.

That part of the absolute alcohol extract which remained undissolved by water was thoroughly dried and afterwards treated with petroleum ether, which dissolved the greater portion of the material. The small amount which was insoluble in the last-named solvent was of a brown color, and showed a decidedly gritty feel

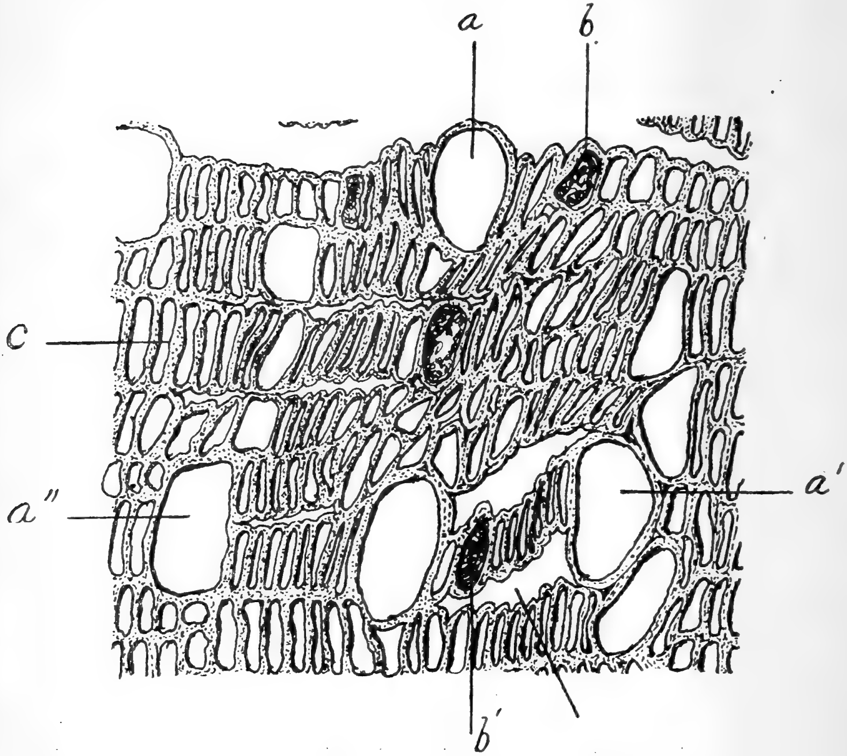


Fig. 7, small portion of cross-section of the bast of the stem, magnified 500 diameters. *a*, *a'*, *a''*, large mucilage cells (usually also containing tannin); *b*, *b'*, tannin cells; *c*, tangentially flattened sieve-tissues.

This species is destitute of bast fibres.

when rubbed with a glass rod. The petroleum ether dissolved the wax, some chlorophyll, and the fatty substances.

After the leaves had been completely exhausted with absolute alcohol, and as much as possible of this liquid drained off, the last

traces were removed with the aid of a water-bath, and the residue of the leaves was then treated with distilled water. This solvent extracted 5·56 per cent. of the leaves. Mucilage and glucose were present in this water extract.

Proximate Analysis of the Bark of the Stem.—This analysis was conducted as in the case of the leaves. Absolute alcohol removed all of the chlorophyll and other substances to the amount of 29·25 per cent. The alcoholic liquid was acid to litmus paper. From this alcoholic extract, water dissolved 8·65 per cent. of the bark, and afforded an acid solution which gave the following reactions:

Ferric chloride, dark green color and precipitate.
Bromine water, heavy yellow precipitate.
Calcium hydrate, little change, even on standing.

Petroleum ether, applied to the extract after the latter had been treated with water, dissolved most of the remaining coloring and waxy substances, but left undissolved a brown residue, consisting of resinous matter and the principle mentioned under the leaves as having a gritty character.

After extraction by absolute alcohol, the bark produced a thick, mucilaginous liquid with water. The liquid gave a precipitate when mixed with alcohol, and reduced Fehling's solution.

Estimation of Tannin in Leaves.—The hide powder method was employed in this and in all other estimations of tannin stated in this paper. There is reason to believe that the hide powder absorbs some of the acid principle as it does the tannin. The air-dry leaves showed 2·18 per cent. of tannin. They also contained 15·21 per cent. of moisture, which, if allowed for, will indicate 2·57 per cent. of tannin in leaves which are absolutely dry. The ash calculated for perfectly dry leaves was found to be 2·94 per cent. It consisted mainly of calcium phosphate with sulphate and carbonate, and a little silica.

Estimations of Tannin in the Barks of Stem and Root.—These were calculated as was done with the leaves, and the following chart is employed with the view of aiding comparison of the several parts of Pinus Strobus:

	Moisture.	Ash in Absolutely Dry.	Tannin in Moist Condition.	Tannin in Absolutely Dry.
Leaves	15·21	2·94	2·18	2·57
Stem bark	9·10	2·31	8·50	9·35
Root bark	11·16	4·67	5·76	6·48

The constituents of the ash of the bark appear to be identical with those of the leaves.

PINUS EXCELSA, WALL.

Proximate Analysis of the Leaves.—Absolute alcohol, applied as in the case of Pinus Strobus, removed 16·23 per cent. of the weight of the leaves. This extract contained almost all of the green coloring matter of the leaf, and showed a strongly acid reaction. When the extract was treated with water, an amount equal to 5·99 per cent. of the leaves was dissolved. This water solution had an acid reaction, and contained an iron-greening tannin. Much of the extract left undissolved by water was soluble in petroleum ether, to which it imparted a dark-green color. Some brown, resinous substance was undissolved by the petroleum ether. The principle exhibiting the gritty character, found at this stage in Pinus Strobus, was also found here.

Water applied to the leaves after their exhaustion with absolute alcohol dissolved 5·74 per cent. of their weight. The water solution contained mucilage in very small amount, but reacted decidedly with Fehling's solution for glucose.

Proximate Analysis of the Bark of the Stem.—This part yielded 25·06 per cent. of extract to absolute alcohol. The green color of the bark was entirely removed. The alcoholic liquid was acid in reaction. From this extract water dissolved 6·42 per cent. of the weight of the bark. The solution so obtained was acid in reaction, and behaved towards reagents in exactly the same way as did the corresponding extract in the analysis of Pinus Strobus.

Petroleum ether dissolved the chlorophyll and wax from the extract, but left considerable of a brown resinous substance, and the principle having the gritty character undissolved.

Water was next applied to the bark. It removed mucilage and glucose. Its solution was of a mucilaginous character, as was that of Pinus Strobus.

Estimations of Tannin in the Several Parts of Pinus excelsa.—These estimations were carried out as described under Pinus Strobus, and the results calculated in the same manner. The following table embodies the percentages:

	Moisture.	Ash in absolutely dry material.	Tannin in moist condition.	Tannin in absolutely dry condition.
Leaves	17·85	2·80	2·93	3·56
Stem bark	7·99	2·18	7·69	8·36
Root bark	8·99	3·03	6·08	6·68

The ashes of the several parts, upon qualitative analysis, showed the same composition as did the ashes of Pinus Strobus.

All the foregoing analyses of both species were made of young trees, growing in the vicinity of Philadelphia, and collected in the month of November. At some other seasons of the year the tannin would probably have been found in larger proportion in the stem bark.

(*To be continued.*)

ON THE CONSUMPTION OF ASPARAGINE IN THE NUTRITION OF PLANTS.[1]

By Y. Kinoshita, Nogakushi.

The fact that asparagine is formed whenever proteids undergo decomposition in plants has been repeatedly made the subject of close investigation by various authors, but much less attention has been hitherto paid to the reverse process—the regeneration of proteids from asparagine. C. O. Muller[2] has asserted that this regeneration can only take place during the process of assimilation in green leaves, and that the action of light and the *status nascens* of carbohydrates are essential. As this statement did not appear to me well founded, quantitative investigations being wanting, I undertook a series of experiments in order to see whether this process might not proceed in the dark.

If we look upon the growing root from the physiological point of view, we must hold it highly probable that the cells of the root, although always deprived of light, are capable of forming the proteids necessary for its growth and development from suitable sources, such as sugar, nitrates and sulphates, or sugar, asparagine and sulphates. It is a well-known fact that mould fungi can form their proteids in this way in complete darkness, and that certain fungi, especially bacteria, grow even much better in the dark than in daylight; it may, therefore, be surmised that the formation of proteids and protoplasm may also proceed better in darkness.

The *relative amount of glucose*, or other suitable material, seemed to me the most decisive factor in the transformation of asparagine into proteids. I therefore selected shoots of soya-beans, which are

---

[1] From Bulletin, Vol. II, No. 4, Imperial University, College of Agriculture, Tokio, Japan.

[2] Ein Beitrag zur Kenntniss d. Eiweissbildung in der Pflanze. Landw., Versuchst., Bd. 33, p. 11.

rich in asparagine, and tried to nourish them with organic materials, repeatedly making microscopical tests in the usual way with alcohol, as described by Borodin, Pfeffer and others, and finally determining the amount of asparagine still present by crystallization, according to E. Schulze's method.[1] Either methyl alcohol, glycerin or glucose was used as organic nutrient in solution along with calcium sulphate.[2] Every seventh or eighth day, this solution was replaced for a day by one containing 0·5 per mille each of the two potassium phosphates, and of hydrated magnesium sulphate, so as to furnish the necessary mineral matters. The cotyledons were cut off at the beginning of the experiment, in order to prevent further formation of asparagine by decomposition of the reserve proteids. A control experiment was made at the same time with soya shoots kept in water, in which an asparagine determination was made just before the other shoots were placed in their nutrient solutions, and again in others at the time when the shoots under investigation were analyzed.

The soya-beans were soaked in water on March 7th, sown on moist sawdust the next day and kept in the dark. In four days, at rather low temperatures, the seeds had germinated and the roots had reached the length of 2–3 cm. At this time I tested the tips of several roots microscopically for asparagine, and found only doubtful traces; but when the roots had become 6 cm. long, the presence of a moderate quantity was easily recognized. At this time the young plants were placed in water on a wire net.

After the length of the entire plants had reached 20–27 cm., and the stem and the root had been found to be rich in asparagine, by microscopical tests, a portion of the shoots was placed, on April 1st, (*a*) in a 1 per cent. solution of methyl alcohol mixed with one-tenth of its volume of saturated gypsum solution; (*b*) in glycerin[3] solution of 1 per cent. with gypsum, and (*c*) in glucose solution, the cotyledons of all the shoots having now been removed.

Whenever the solutions became turbid from bacterial growth, they

---

[1] Landw., Jahrbuch, 1888, pp. 688 and 701; also 1880, p. 14.

[2] In some trials I made use of sodium acetate and tartrate, but not with satisfactory results, perhaps because the conditions were not favorable.

[3] Preliminary experiments had convinced me that a solution of 10 per cent. or even of 5 per cent. glycerin is not adapted for the further development of the plant. Indeed, in the 10 per cent. solution the shoots died after two days.

were renewed at once. When the hypocotylous part of the stem had reached about 30 cm. in length, growth seemed to stop in it, while the growth of the shoots above the cotyledons was now more marked than before. It may be mentioned that most of the leaves of the shoots cultivated in glycerin solution were somewhat larger than those grown in methyl alcohol. Microscopical examination exhibited now a very great difference between the amount of asparagine present in the control shoots, and that present in the other cases. Direct tests for the presence of dissolved reserve albumin, made upon an aqueous extract by addition to it of nitric acid, showed that there was none present in the shoots cultivated in sugar and glycerin. We see, therefore, that the decrease of asparagine is coincident with an increase of the dissolved proteids. Microscopical tests made it further highly probable that the amount of other amido-products was continuously decreasing, while tests for sugar with Fehling's solution revealed its presence in the shoots grown in glycerin, but neither in those grown in methyl alcohol nor in the control case.

Soon afterwards, on April 27th, a final measurement of dimensions and a quantitative determination of asparagine were made. The stem, without the hypocotylous part, had a length of 4–14 cm., in the control case No. 2; a length of 11–19 cm. in glycerin, and of 8–19 cm. in methyl alcohol.

The quantity of asparagine was as follows:

Date of Determination.	Dry Matter in Grammes.	Asparagine in Grammes.	Asparagine Per Cent. in Dry Matter.
Control shoots, No. 1, April 1st . . .	3·966	0·853	21·5
Control shoots, No. 2. April 27th . . .	2·948	0·847	28·7
Control shoots, No. 3, April 27th . . .	3·611	0·906	24·0
Shoots in methyl alcohol, April 27th .	2·698	0·512	18·9
Shoots in glycerin,[1] April 27th	4·590	0·629	13·7

[1] For determining the amount of asparagine in those shoots which had been kept in the dilute glucose solution, the material was not sufficient, but I microscopically examined the shoots for asparagine on May 8th (when some of the leaves showed brownish spots, indicating a gradual decay), and found a not inconsiderable amount of it still present. I do not doubt that if we could introduce more concentrated sugar solution into the cells of the shoots the shoots would continue to grow in the dark until all the asparagine had been transformed into proteids or protoplasm, provided the necessary mineral salts had been also introduced.

The determination of asparagine in the control shoot No. 1, was made after the removal of the cotyledons (April 1st), when the experiment proper commenced. If we compare this result with

that yielded by the control shoot No. 2, we find an increase of asparagine in percentage of dry matter, due probably to the gradual conversion of other amido-compounds into asparagine.[1] The fact that in the control case No. 3, where the cotyledons had not been removed, a smaller percentage of asparagine was found than in No. 2, may probably be due to the galactans and other carbohydrates gradually becoming soluble and getting consumed in support of respiration, thus protecting proteids as well as amido-compounds from further changes, and retarding the production of asparagine.

The principal conclusions which we can draw from the results obtained are:

(1) Glycerin and methyl alcohol, supplied by the roots, cannot only hinder the production of asparagine in the shoots, but are also capable of diminishing the amount already formed.

(2) Glycerin is much more effective than methyl alcohol. It also forms sugar in the cells.[2]

(3) Since shoots have been found to grow better in solutions of methyl alcohol and glycerin than in water, and also to show the presence of dissolved proteids by the nitric acid test, it is safe to assume an increasing protein production in the shoots thus nourished; in other words, methyl alcohol, as well as glycerin, can serve for the regeneration of proteids from asparagine, and as this process can go on in *perfect darkness*, light must be denied to have any *direct* action in supporting it.[3]

COTTON SEED OIL.

By Arthur R. Lewis, Ph.G.

[Abstract from Thesis.]

The first step in the process of manufacturing cotton seed oil consists in screening the seed to remove dirt and other foreign substances. The seed are then "relinted," as it is called, which implies the removal of any adhering cotton. This is accomplished by passing the seed through a machine in which small hooks and saws are

---

[1] Compare *O. Loew*, this Bulletin, Vol. II, No. 2.

[2] This formation of sugar is in accordance with the observations of Laurent, Ar. Meyer and Th. Bokorny. The latter author has also observed starch formation from methyl alcohol under the influence of daylight.

[3] It is however indirectly of great importance, because it yields the necessary carbohydrates; for, the more sugar there is present in a cell, the quicker will asparagine be transformed into proteids.

so arranged as to effect this purpose. The "relinting" done, the seed are hulled by means of buhr-stones set in such position that the hull, or testa, is cracked without crushing the seed to any considerable extent. The hulls are then separated by machinery from the internal portion of the seed, the endosperm, which is next passed between heavy chilled rollers. This treatment crushes the seed into a flat mass and thereby ruptures the oil cells. The crushed mass is put through heaters, in which it is cooked for fifteen or twenty minutes, and from which it is transferred to the cake-former. Here it is prepared for the press, and consists of a sticky mass. After the press boxes have been filled, hydraulic pressure is applied, usually from 3,000 to 4,000 pounds per square inch of cylinder ram. After the expression of the oil, the residue is known as press cake and cake meal.

The entire process, from the time the seed enter the screening "boll" until the oil is extracted and the cake removed from the press, occupies about thirty-five to forty minutes.

The yield of oil varies with the locality and richness of the soil, as well as with season and climatic changes. Moist soil affords the best yield. In some of the excessively dry summers of the Southwest the seed do not contain enough oil to pay for its extraction.

The average yield per ton of seed is from 36 to 40 gallons, or over 250 pounds, of oil. From 1 ton of seed about 30 pounds of lint, 900 pounds of hulls and 750 pounds of cake meal are also obtained. The remaining 70 pounds is made up of dirt and loss in working.

In Georgia and Mississippi and in some other sctions of the United States, the seed are sold by the bushel instead of the ton. It is estimated that a bushel of seed will yield from 1½ to 2 gallons of oil, the amount depending upon the conditions under which the seed were grown.

In the crude state, the oil varies in color from a deep yellow to a ruby red, and sometimes to dark brown, or even black. The method of refining the oil consists in washing it with a solution of alkali. A solution of caustic soda, of about 12 to 15 per cent. strength, is usually employed. Of this, 1 pint is added to 10 pints of the oil. The mixture is thoroughly agitated for from thirty to fifty minutes. This treatment causes the precipitation of the coloring and albuminous matter; the precipitate is separated by

means of steam filters. The alkali remaining in the oil is neutralized by repeated washing with cold water, containing a small quantity of an acid. When the oil becomes neutral to litmus paper, it is run into large tanks. After standing in these for some length of time, the oil becomes of a bright lemon-yellow color, and is ready for commerce.

In some oil mills the treatment with alkali to remove color is not carried as far as is described above, but, to complete the refining, the oil is subsequently treated with bleaching powder and dilute sulphuric acid. This plan, however, is now rarely employed; for, since the oil has to some extent become an article of food, the unpleasant odor and taste imparted by the bleaching powder would condemn the brands purified by this means.

The loss in refining the oil is estimated to be from 5 to 8 per cent.

When the oil is subjected to cold and pressure the stearin separates, and much of that used in the manufacture of candles, etc., is now obtained in this way. Below 10° C. the oil solidifies. It has a specific gravity of ·920 to ·930 at 15° C.

A sample of cake meal was found by the author to contain 8·5 per cent. of ash. Nine per cent. of this ash was silica.

Two samples of cake meal from different companies were exhausted with petroleum ether, in order to ascertain the amount of oil contained. When the solvent was evaporated, 5·31 and 6·50 per cent. of oil were obtained. This points to the fact that a large part of the oil is not removed by the pressure applied.

Cotton seed meal contains about 9 per cent. of ammonia and 8 per cent. of other nitrogenous matter. The presence of the latter makes it a valuable food for cattle, the chief use to which it is put in the West; while for the same purpose large quantities of the meal are annually exported to Germany. It is further reported that some of the very poor people of that country make the meal into a bread which they say is palatable and wholesome.

The superiority of the cake meal over the entire crushed seed as a stock food lies in the fact that the greater part of the oil, which has a cathartic action, has been removed.

The hulls also are used as a stock food, but are much inferior to the meal.

On account of its nitrogenous constituents, and particularly the ammonia, the meal forms an excellent fertilizer.

The lint that is removed from the seed by the process of relinting is used for such purposes as padding clothing and cheap furniture.

The annual production of oil in 1888 was 500,000 barrels, while in 1893 it reached 940,000 barrels.

The uses of the oil in place of hog's lard for culinary purposes, as an adulterant of more expensive oils, as a constituent of oleomargarine, or butterine, and in the manufacture of high-class soaps, are all well known.

EDITORIAL.

No apology is offered for the dearth of editorial comments in this number, except the very obvious one that they are crowded out by original matter. Only one contribution has been copied from another publication, and that from a source inaccessible to most readers of this JOURNAL.

With such an array of the results of original research, we are led to believe that the scientific side of pharmacy is not falling into neglect. It is certain that there is as much necessity for research work as ever there was, especially in the line of establishing standards of strength and purity for medicinal preparations. If the energy wasted in writing long articles on "Pharmaceutical Education—Degrees and Requirements," and the "Past, Present and Future of Pharmacy," were turned into the proper channel, and the time lost by pharmaceutical bodies in listening to such "stuff" were otherwise occupied, the cause of pharmacy would be materially advanced. We admit that those relating to education are subjects for short papers and discussions, but only in the briefest manner. Of what use, however, is a long dissertation on the "Past, Present and Future of Pharmacy?" Yet we believe a paper with a title something like that was awarded some sort of a prize before a pharmaceutical body during the past summer. Of the past, it may be said, let it be past; of the present we know, and of the future we know nothing, and volumes of theory about improbable possibilities will not help us to know it any better. More laboratory facts and less writing-table theories are the crying necessities of the hour in pharmaceutical science.

At a recent examination of the *State Pharmacy Board*, held in Philadelphia, 85 applicants presented themselves for the certificate of qualified assistant, and 87 for that of registered pharmacist. Sixteen of the former and 11 of the latter succeeded in passing the examination, and were ordered to be registered.

At Pittsburg, 52 applicants presented themselves for the certificate of qualified assistant, and 56 for that of registered pharmacist. Eighteen of the former and 9 of the latter succeeded in passing a satisfactory examination, and were directed to be registered. At this rate the State will not be overrun with pharmacists very soon.

The next examination will be held in Philadelphia, on Saturday, January 18, 1896.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

LES DROGUES SIMPLES D'ORIGINE VÉGÉTALES. Par MM. G. Planchon et E. Collin. Tome Deuxième. Paris: Octave Doin. 1896.

As promised one year ago, when the first volume appeared, this, the second volume, has been completed within the specified time. It is an octavo of 988 pages, and includes the index to the two volumes. The illustrations are numerous and of a high order of excellence, 753 of them being distributed through the text.

Volume I closed with the Campanulaceæ, and Volume II commences with the Compositæ, and terminates with the Ranunculaceæ. If one part of this second volume is more complete than another, it is that section devoted to the Cinchonas, in which a reasonable amount of space is devoted to those cultivated in India. Throughout the work, American drugs have received a full share of consideration, and the microscopic structure of many of them is illustrated.

An additional feature of the book is the illustration of the microscopic appearance of many drugs in powder form.

HANDBOOK OF PHARMACY, embracing the theory and practice of pharmacy, and the art of dispensing. By Virgil Coblentz, Ph.G., Ph.D., F.C.S. Second edition. Revised and enlarged, with 437 illustrations. Philadelphia: P. Blakiston, Son & Co. 1895. Pp. 572.

Just about a year ago, the first edition of Coblentz' Pharmacy was reviewed in this JOURNAL. The new edition has been enlarged and improved by the addition of a chapter on the "Analysis of Urine," and one on the "Applications of the Microscope in Pharmacy," both of which are attractively written, and increase the value of the book. This work has earned for itself a well-deserved reputation, and should be in the library of every pharmacist and pharmaceutical student in the country. Part III, on "The Art of Dispensing," is especially well written, and if more physicians would carefully study the whole work, and especially this part of it, there would, perhaps, be less mistakes for the pharmacist to detect, and fewer hair-breadth escapes for the patient.

THE ART OF COMPOUNDING, a text-book for students and a reference-book for pharmacists at the prescription counter. By Wilbur L. Scoville, Ph.G. Philadelphia: P. Blakiston, Son & Co. 1895. Pp. 264.

The author has experienced the need of an extended treatise on the prescription, and we can best convey an idea of the scope of the work by giving the titles of the chapters, as follows: Introductory; The Prescription; Nomenclature; Mixtures; Emulsions; Confections; Electuaries and Jellies; Pills; Lozenges, Troches, Bacills, Tablets, Pastilles and Lamels; Powders; Suppositories; Ointments, Cerates and Plasters; Poultices, Plasmas, Pencils and Medicated Dressings; Homœopathic Pharmacy; Incompatibility. The chapter on Homœopathic Pharmacy is a concise statement of that subject, and will be a novelty to most pharmaceutical readers.

The author has realized that dispensing pills is still an important part of the pharmacist's duty, and he has, therefore, devoted considerable space to the subject and done himself credit. The whole book is carefully written and will well repay thorough reading.

A Practical Treatise on Materia Medica and Therapeutics. By John V. Shoemaker, M.D., LL.D., Professor of Materia Medica, etc., in the Medico-Chirurgical College of Philadelphia. The F. A. Davis Company, Publishers, Philadelphia. Third edition. Revised.

This is a work of over eleven hundred pages, and as it treats of all of the official, and a large number of the unofficial drugs, both from the pharmacological and therapeutical standpoints, and of many of them in much detail, it constitutes one of our most comprehensive text-books on the subject.

This third edition has been extensively revised, and includes the description of many new drugs which have come into prominence since the last edition was issued. Also, as the author tells us, "The subject of treatment by means of animal extracts, secretions or juices, and immunized serum or antitoxins has been rewritten, and the endeavor has been made to give a fair presentation of the present state of knowledge concerning the value of these agencies in combating disease."

On the whole we have, in Dr. Shoemaker's work, a treatise intelligently conceived and executed, and one which embodies the results of the latest researches.

The volume consists of three parts. Part I is devoted to classification of the materia medica, the pharmacy of drugs, prescription writing, etc. Part II takes up the various drugs and treats of them in alphabetical order, giving (1) the botanical or chemical definition and physical characters of the remedy, with the strength and dosage of the various preparations; (2) its physiological actions, including toxicology and antidotes, with special effects, if any, upon individual organs and tissues; and (3) the therapeutical indications, with illustrative formulæ, suggestions, etc. Part III is devoted to non-pharmacal remedies, including electro-therapeutics, massage and rest-cure, pneumotherapy, hydrotherapy, climatotherapy, diet in disease, psycotherapy, etc.

It is scarcely possible that in a work of this character some shortcomings should not be observed. For example, on page 453, it is stated that the bark of the root of pomegranate is official, while that of the stem is not, whereas the U. S. P. of 1890 distinctly recognizes both. Also the author apparently uses *ine* and *in* indiscriminately as the terminal syllables of the names of active principles, a practice which must be confusing to the student, since by general consent, in this country at least, the names of alkaloids should terminate in *ine* while those of the non-alkaloids should terminate in *in*.

The author's classification of the drug-yielding plants, a classification essentially like that adopted by Brunton, is behind the times. Drs. Shoemaker and Brunton are by no means alone among writers on materia medica in ignoring the progress which botanical classification has made within recent years. It would be a refreshing sign and a decided novelty to meet with some work on the subject, whose botanical classification was really abreast of the times.

Another shortcoming we note is in the author's statement of the composition of the oil of wintergreen. He reiterates the statements of Cahours, made over a half century ago, that 90 per cent. of the oil consists of methyl-salicylate, and 10 per cent. of gaultherilene, while, as a matter of fact, it was demonstrated years ago, by Pettigrew and others, that the percentage of methylsalicylate is at least 99 per cent., and that 1 per cent. or less consists of a resin solid mixture, whose composition has not been completely ascertained.

But the above are minor defects, which do not seriously mar a valuable work.

The publishers are to be congratulated on the good appearance of the book.

E. S. Bastin.

Outlines of Materia Medica and Pharmacology. By H. M. Bracken, M.D., Professor of Materia Medica, Therapeutics and Clinical Medicine, University of Minnesota. Philadelphia: P. Blakiston, Son & Co. 1895.

There is doubtless a growing demand in our medical schools for more compact text-books. Many of the older ones and some of the new are not only expensive, but they are too long-drawn-out to permit of the student's reading them thoroughly, do equal justice to a dozen or more other text-books of similar length on other branches of medicine, and at the same time accomplish the large amount of laboratory work required in a modern medical course, all in the limited period of three or four terms. Hence the diminished sale of such comprehensive works, and the increasing popularity of quiz-compends. The majority of the latter, however, err in going to the opposite extreme. They are often too skeletal and juiceless, deal too exclusively with the baldest facts, and too little with reasons, to satisfy the student who has a care to know his profession, and not merely to pass his examinations.

The writer of this work seems to have appreciated the situation and to have avoided both extremes. He has given the essentials of a vast subject within the limits of less than four hundred pages, and has done it in a way that is far from dry and uninteresting. Excellent judgment has been exercised in the selection of the facts to be presented and those to be excluded, so that the book contains little that is not of direct value to the practitioner. What the author says about the action and uses of drugs, while, of course, condensed and pithy, is singularly lucid and full of helpful suggestion to the thoughtful student.

The plan of the book is simple. After the introduction, which deals with such topics as Official Preparations, Administration of Drugs, Dosage, Prescription Writing, Physiological Action of Drugs, etc., the different *materia medica* are treated of in the following order: (1) The Acids; (2) The Metals; (3) The Non-Metallic Elements; (4) The Carbon Compounds; (5) The Animal Kingdom; (6) The Vegetable Kingdom.

E. S. Bastin.

Year-Book of Pharmacy. London: J. & A. Churchill. 1895. Pp. 455.

The present volume of this valuable annual is fully up to the standard of its predecessors. The excellent character of the papers read at the Bournemouth meeting we have commented on before, and most of them were published in abstract in the September number of this Journal.

Contribution to the Flora of Yucatan. By Charles Frederick Millspaugh. Field Columbian Museum: Publication 4. Botanical series, Vol. I, No. 1. Chicago, 1895.

We learn from the introduction "that little is known of the details of the botany of Yucatan, except that it is very poor and scanty, and largely composed of plants that still bear long droughts without injury. The poverty of the flora is ascribed to the fact that the copious rains rapidly filter away through the porous limestone substratum.

"In 1835 Jean Jules Linden, a Belgian horticulturist, gathered about twenty-five species of plants in Yucatan, while on his way to Vera Cruz." Further collections were made in 1848, by Hon. E. P. Johnson, of seventy five species; and in 1885 and 1886, by Dr. George F. Gaumer, of 224 species.

The latest expedition was made in January, 1895, by Allison V. Armour, and the result has been a very material addition to the knowledge of the flora of Yucatan.

NOTES ON THE COMMERCIAL TIMBERS OF NEW SOUTH WALES. By J. H. Maiden. Sydney, 1895. Pp. 32

The author prefaces the enumeration and description of the various native woods by brief information on the forest wealth of the colony, timbers for export, seasoning processes, the proper time to fell timber, etc.

The various commercial timbers are then classified, and each is briefly described. The contribution is of value to the inhabitants of New South Wales and of interest to the foreign reader. It is issued under the authority of the Minister for Mines and Agriculture.

MINNESOTA BOTANICAL STUDIES.—Geological and Natural History Survey of Minnesota. Conway MacMillan, State Botanist. Bulletin No. 9, Part VII. With seven plates.

The following contributions make up this number: "On the Genus Cypripedium, L., with Reference to Minnesota Species." By Henrietta G. Fox. "Poisonous Influence of Various Species of Cypripedium." By D. T. MacDougal. "Tree Temperatures," recorded by Roy W. Squires. "Some Hepaticæ of Minnesota." By John W. Holzinger. "A Study of Some Minnesota Mycetozoa." By E. P. Sheldon. One of the plates shows, by map, the distribution of the genus Cypripedium in North America.

KENTUCKY PHARMACEUTICAL ASSOCIATION PROCEEDINGS. 1895.

The Proceedings of this Association show that the members are endeavoring to replace all ready-made preparations—secret, non-secret and proprietary—by honest, National Formulary products, and, in that undertaking, we wish them success.

VIRGINIA PHARMACEUTICAL ASSOCIATION PROCEEDINGS. 1895

Several meritorious papers appear in the Proceedings of this Association, and the only criticism to be made is that these original papers are given an inconspicuous place in the appendix.

SEMI-ANNUAL REPORT OF SCHIMMEL & CO., Leipzig and New York. October, 1895.

NOTES ON LOCAL ANÆSTHESIA BY INFILTRATION, as suggested by Dr. C. L. Schleich. Philadelphia: John Wyeth & Brother. This contains the formulas of a number of tablets recommended for local anæsthesia, by Dr. Schleich, of Berlin, and by Dr. Van Hook, of Chicago.

A COMPEND OF PHARMACY. By F. E. Stewart, M.D., Ph.G. Philadelphia: P. Blakiston, Son & Co., 1895. Pp. 187. Fifth edition.

We cannot say much for a "quiz compend," "aid," or anything else that is intended to assist the student to "cram" for examination, no matter how

creditably written. It is not this work in particular that we single out for disapproval; it is the whole class.

THE PHYSICIANS' VISITING LIST for 1896. P. Blakiston, Son & Co. This well-known list has reached its forty-fifth year of publication, and comes with several new features that make it better than ever.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, December 17, 1895.

On motion of Mr. Wiegand, Mr. George M. Beringer was chosen chairman. On motion of Prof. Trimble, the reading of the minutes of the previous meeting was omitted, and they were ordered to stand as published.

The next in order of business were presentations to the Library and Museum. The following is a list of the books presented; sixteen volumes of the Labor Commissioner's Reports; British Year-Book of Pharmacy, 1895; No. 4 of Vol. III, Department of Agriculture; United States National Herbarium; Reprint of Collection of Plants from Northern Idaho; Materia Medica and Therapeutics, third edition, by J. V. Shoemaker, M.D. Through the American Journal of Pharmacy: Stewart's Compend of Pharmacy; Scoville's Art of Compounding; Proceedings of the American Academy of Arts and Sciences, Boston, 1895; Special Consular Reports—Highways of Commerce, 1895; Contributions from the Herbarium of Franklin and Marshall College, 1895; and, through the instrumentality of Mr. Howard B. French, eighty-five volumes of Reports of the Interior Department were presented by General H. H. Bingham.

Attention was called to a set of hydrometers, presented by Mr. Charles Bullock, on behalf of Mr. L. C. Francis, one of the oldest and most reliable makers of physical and scientific apparatus in this country.

Two samples of carborundum, from the Niagara Electric Works, presented by Charles Bullock and C. A. Seither, Ph.G., were shown.

A sample of dry Anti-Diphtheritic Serum, manufactured by Messrs. Burroughs, Wellcome & Co., of London, and sent by Messrs. Fairchild Bros. & Foster, was exhibited. The serum, in the form of golden scales, is put up in tubes containing one gramme, which is said to represent ten cubic centimetres of normal liquid Anti-Diphtheritic Serum. Professor Trimble was of the opinion that, if it retained its potency, this would probably become the leading form.

The first paper, on "Distilled Water," by Prof. J. U. Lloyd, of Cincinnati, was read by Professor Trimble, who remarked that this paper was of particular interest on account of the action taken during the past year to enforce the Pure Food Law in Ohio. Two samples of distilled water, prepared and tested as described in the paper, were shown. One of these contained a flaky sediment, and the residue obtained upon evaporation of 1,000 c.c. of a similar sample was also shown. Considerable discussion arose in reference to the composition of this sediment, Professor Trimble believing it to be due to the solvent action of the water on the glass. Mr. Kebler held a different opinion, and stated that it was calcium sulphate from the still. Mr. F. W. Haussmann raised the question as to its bacteriological character, but the fact of the water containing this sedi-

ment standing the permanganate test, seemed to give a negative answer to this question.

The second paper, entitled "Some Observations on Kola," by Messrs. A. R. L. Dohme and Hermann Engelhardt, of Baltimore, was also read by Professor Trimble. The main object of these investigators was to establish the relative alkaloidal value of the African and Jamaica nuts, the latter costing about one-third more than the former. An album containing illustrations relative to the cultivation of the kola plants in Jamaica, and belonging to Mr. A. F. Kilmer, of the firm of Johnson & Johnson, was shown, and, in compliance with a request from Professor Trimble, Mr. Kilmer made some remarks on this subject. He said he was surprised that the authors made no reference to kolanin, which is found in the green nuts. This drug has been found to have marked value in sustaining athletes during excessive bodily exercise, and its value as a heart stimulant is augmented by the fact that no reaction seems to follow its use.

Mr. Beringer stated that he had used benzol in some experiments on guarana, and its possible utility in extracting the similar alkaloids of kola was suggested thereby.

Mr. Lyman F. Kebler read a paper on "Spermaceti," and showed samples of that substance. Mr. Kebler regards the ether number, the acid number and the saponification equivalent as important means of establishing the identity and purity of this commodity, and in comparing the results obtained in his work on various samples, he was led to the conclusion that the tests of the U. S. Pharmacopœia for this substance answer more nearly for those of cetin. His method of obtaining the specific gravity of spermaceti and similar substances is of interest. The substance is melted and allowed to drop on a surface of glass, and the little plates so obtained allowed to float in a mixture of alcohol and water, the specific gravity being determined from the specific gravity of the liquid.

Professor Remington stated that the crystalline character of spermaceti is modified by the amount of pressure used in its manufacture, and that a finer product is obtained in cold weather. He furthermore stated that, in order to determine the value of the pharmacopœial tests, absolutely pure spermaceti should be used in making observations.

Mr. Chas. H. LaWall then read a paper entitled "Beechnut Oil," and exhibited some beechnuts collected in Sullivan County, this State, and also a sample of oil which he had expressed from nuts obtained in the same locality. Mr. LaWall, in replying to a query from Professor Remington, said that beechnut oil is not an article of commerce in this country, as he had made several attempts to purchase it, but did not succeed.

The Chairman called attention to specimens of elder roots sent by Mr. Howard B. French, which had grown in a drain. The numerous rootlets so produced were so fine and interlaced as to form a spongy mass corresponding in shape to that of the drain.

Mr. Wm. B. Thompson presented specimens of native borax and calcium borate which had been obtained from the borax region in California and Nevada.

Mr. Beringer read a paper on "Rhus Poisoning." Several efficient remedies for this trouble were suggested in his paper, and also by others present. Mr. Beringer stated that the volatile acid is the toxic principle, and that the dried

leaves are not poisonous—this fact suggesting the advisability of their adoption in the U. S. Pharmacopœia.

A new form of suspension balance was exhibited and described by Dr. J. R. Witzel. The beam is suspended by two wires of German silver, or copper, so that knife edges are avoided. The smaller balances are sensitive to ·02 grain.

Mr. Wm. R. Warner sent a programme of the graduating class of 1856, accompanied by his matriculation ticket. The subjects of the theses indicated the high character of the work done by the students of those days.

Professor Remington desired to personally thank the authors of the papers for their contributions, and said that we had cause for hoping that the high standing of the College would be maintained, when six original papers were on the programme of one meeting.

The papers were referred to the Publication Committee, and, on motion of Professor Trimble, the meeting adjourned.

T. S. WIEGAND,
Registrar.

NOTES AND NEWS.

A borax-carmine staining fluid is prepared by P. W. Squire (*Phar. Journal*, December 7, 1895), as follows:

Carmine	3 grammes.
Borax	4 "
Distilled water	85 cubic centimetres.
Alcohol	115 " "

Dissolve the borax in the water, add the carmine and heat in a flask until the mixture just boils. Cool the solution and add gradually to the alcohol; after twenty-four hours, filter. At first sight the borax would appear to be in excess, but the proportion given is necessary to dissolve the carmine. The solution stains well and is more alcoholic than that known as Grenacher's. There are many far better nuclear stains, notably hæmatoxylin and some aniline dyes, but there is none as good as borax-carmine for staining cellulose.

The metal glucinum, it is stated, is emerging from its position as a chemical rarity, and is coming to the front, much as aluminum did a few years ago. It is even lighter than aluminum, but its chief value consists in the fact that its electrical conductivity is as high as that of silver, and, consequently, higher than that of copper. It is less extensible than iron, and more durable. At present, its value is 71s. 4d. per pound, which is prohibitive for large quantities, but this is only one-tenth the price of platinum, weight for weight, and one-one-hundred-and-sixtieth the price of platinum, volume for volume.—*Ironmonger*, November 16, 1895.

Improvements in the *manufacture of acetone and in the apparatus therefor*, is the subject of a patent by R. Jürgensen, Prague, and A. Bauschlicher (English Patent No. 23,438, December 3, 1894). The claim is for an improved process for the manufacture of acetone, by distilling in a retort jacketed with molten lead, a basic calcium acetate, which is made by adding 5 per cent. of lime to a very concentrated solution of calcium acetate, and evaporating to dryness. The jacket of molten lead is used in order to avoid overheating the contents of the retort and consequent formation of by-products. The contents of the retort are

stirred during the distillation, and the acetone formed is carried off by a current of indifferent gas (such as generator gas, water gas or superheated steam). The mixture of gas and vapor passes through a box where dust is deposited, after which the acetone is condensed. The crude product is purified by mixing it with water, which dissolves the acetone and leaves the tarry impurities undissolved. After these have been removed, the clear, aqueous solution is submitted to fractional distillation. From 100 parts of acetate of lime, 25 to 26 parts of pure (99·5 per cent.) acetone are obtained.—*Jour. Soc. Chem. Industry*, November 30, 1895.

The following note on *camphor* from the *Kew Bulletin*, of November, 1895, will throw some light on the price of this commodity:

"The increased demand for this substance, which is obtained by distillalation from the wood of Cinnamomum Camphora, a tree of Japan and China, has led to inquiries being addressed to Kew, as to its extended cultivation in the Colonies. It grows freely in Southern Europe and is suitable for planting in any warm temperate climate.

"The following note is extracted from the *British North Borneo Herald*, for September 16, 1895:

"'Nearly twenty years ago Formosa camphor was quoted at $20 per picul; but from various causes, chiefly owing to the invention of smokeless gunpowder, in the manufacture of which it is largely used, the price has now risen to $79 per picul. In this connection it is a curious fact to note that camphor, which discharged a large volume of carbon during combustion, should produce a smokeless compound.'

"The cause assigned for the rise of price proves to be erroneous, as will be seen from the following note, for which Kew is indebted to Sir Frederick Abel:

"'Camphor *was* used in the earliest days of the manufacture of a successful smokeless powder for artillery and small arms; but its employment was soon demonstrated to be attended with serious practical disadvantages, and its application for this purpose can, therefore, not be said to have been other than experimental, and of no great importance even at that time, as affecting the market value of camphor.'

"'This substance has, however, been used extensively for many pears past, and no doubt in continually increasing quantities, for the conversion of collodion cotton into the material known as celluloid, which is applied to the manufacture of imitation ivory, tortoise-shell, horn, and a great variety of purposes.'"

According to a patent of F. Bayer & Co. (English patent No. 22,617, November 22, 1894), the patentees had formerly found that acetylamido-phenyl salicylate does not possess the toxic properties of salol, and can be substituted for it with advantage. They now find that the lactylamidosalol is superior to the acetyl compound, owing to its greater solubility in water. They claim the lactylamidophenyl salts, salts of salicylic acid, and of ortho-, meta- and para-cresolcarboxylic acids. These are made by acting on amidosalol or the corresponding compounds of the cresolcarboxylic acids, with lactic acid, lactic anhydride, lactide, or an ethereal salt of lactic acid. They may also be obtained from lactamide and a salt of amidosalol.—*Jour. Soc. Chem. Industry*, November 30, 1895.

CLASSES

—OF THE—

PHILADELPHIA COLLEGE OF PHARMACY,

SEVENTY-FIFTH ANNUAL SESSION, 1895-1896.

FIRST YEAR CLASS.

Name.	*Place.*	*State.*	*Preceptor.*
A'Becket, Thos. Hopkinson,	Philadelphia,	Pa.	J. J. Moore.
Abrams, Fred. Arthur,	Philadelphia,	Pa.	John Wyeth & Bro.
Albert, Harry Clay,	Maysville,	Ky.	
Albright, Chas. Henry,	Philadelphia,	Pa.	John P. Frey.
Althouse, Harry B.,	Harrisburg,	Pa.	F. J. Althouse.
Anderson, Geo. Chas.,	Meadville,	Pa.	A. L. Ballenger.
Anderson, Ralph,	Latrobe,	Pa.	Jesse W. Pechin.
Baer, Lemuel Miles,	Lancaster,	Pa.	A. A. LeFevre.
Ballamy, John Francis,	Tavistock,	Eng.	H. T. Gregory.
Barr, David Ford,	Elkton,	Md.	B. J. Stathem.
Barth, Chas.,	Philadelphia,	Pa.	W. G. Nebig.
Bartholomew, Arthur,	Golden Gate,	Cal.	J. M. Higgins.
Bates, John Phillips,	Mansfield,	Pa.	J. M. Smith.
Batsford, Ernest James,	Waterloo,	N. Y.	Batsford & Bisdee.
Beane, Geo. Ridenour,	Bainbridge,	Pa.	H. C. Blair.
Beardsley, Carrie Frances,	Chicago,	Ill.	
Beauchamp, Roscoe Frank,	Baltimore,	Md.	Chris. Petzelt.
Beavans, Wm. Eugene,	Enfield,	N. C.	P. Fitch, M.D.
Beh, Ed.,	Philadelphia,	Pa.	Geo. W. Goldsmith.
Berberich, Herman,	Baden,	Germany,	Eberly Bros.
Berg, Harry Chas.,	Philadelphia,	Pa.	Special Chemistry,
Berry, Robert Taylor,	Charlestown,	W. Va.	P. H. Franklin.
Beyerle, Chas. Wellington,	Bernville,	Pa.	Edwin M. Boring.
Bicking, Edgar Clifton,	Chester Co.,	Pa.	John L. Woodruff, M.D.
Bingman, Harry Clayton,	Jersey Shore,	Pa.	J. F. Gray.
Bishop, David Kirlin,	Patterson,	Pa.	M. P. Crawford.
Black, Robert Morris,	Philadelphia,	Pa.	P. M. Kelly, M.D.
Bloor, Alfred Wainwright,	Manor,	Tex.	
Booth, Harry Emanuel,	Camden,	N. J.	J. V. Antill, M.D.
Booth, John Franklin,	Roanoke,	Va.	C. C. Hudson.
Booth, Thos.,	Philadelphia,	Pa.	Alex. Wilson.
Brach, Cornelius,	Kercenkien,	Germany,	W. E. Miller.
Bradford, Edward Burton,	Newport,	N. J.	A. La Dow.
Bready, Wm. Ramsey,	Philadelphia,	Pa.	A. J. Frankeburg.
Brennan, Thos. Francis,	New London,	Conn.	W. B. Moon.
Brewton, Swain Hoffman,	Cape May City,	N. J.	Wm. Porter.
Brown, Hampton Housman,	Pleasant Grove,	Pa.	B. L. Brown, M.D.
Brown, James Lawrence,	Philadelphia,	Pa.	McClure, Heritage & Co.
Brueckmann, Walter,	Philadelphia,	Pa.	Emil Jungmann.
Buckingham, Harry Sheldon,	Clayton,	N. J.	H. G. Shinn.
Calloway, Henry Willis,	Baltimore,	Md.	
Calvert, James Howard,	Perryville,	Md.	N. C. Cameron.
Cassel, Oscar Heebner,	Norristown,	Pa.	Wm. Stahler.

Name.	*Place.*	*State.*	*Preceptor.*
Chadwick, Samuel Hilton,	Wilmington,	Del.	Z. James Belt.
Clark, John Edward,	Lock Haven,	Pa.	W. K. Saxton.
Clark, Robert Hall,	Union City,	Ind.	J. P. Frey.
Cliffe, Joshua,	Norristown,	Pa	W. L. Cliffe.
Cohen, John Thos.,	Upland,	Pa.	R. H. Henderson.
Coleman, John Edward,	Carbondale,	Pa.	B. A. Kelly.
Cooper, Walter Greenlee,	Savannah,	Mo.	J. P. Corper.
Cowen, John James,	New York,	N. Y.	R. R. May.
Cox, Linwood,	Norristown,	Pa.	Atwood Yeakle.
Crawford, Victor Horace,	S. Bethlehem,	Pa.	Geo. W. Roland.
Creighton, Wm. Stewart,	Barnesville,	O.	I. J. White.
Cunningham, Orrick Sim,	Clear Spring,	Md.	Geo. W. Hurd.
Dale, David,	Philadelphia,	Pa.	John Wyeth & Bro.
Davis, Geo. Eckley,	Eckley,	Pa.	C. J. Schneider.
Davis, Jacob Bumgardner,	York,	Pa.	J. R. Smyser.
Davis, James Joseph,	Scranton,	Pa.	C. Lorenz.
DeBeust, Wm. Harry,	Philadelphia,	Pa.	R. H. DeBeust, M.D.
Decker, Wm. Robert,	York,	Pa.	R. Wm. Ziegler.
DeHaven, Ida Valeria,	Bayonne,	N. J.	J. E. Salter, M.D.
Dirmitt, Chas. Walter,	Philadelphia,	Pa.	Chas. H. Dirmitt, M.D.
Dorwart, Wm. Elmer,	Lancaster,	Pa.	A. G Hosteller.
Donahue, John Linton,	Bloomsburg,	Pa.	Moyer Bros.
Doudna, Joel S.,	Belmont Co.,	O.	J. T. Ely Co.
Downing, Wm. Henry,	Wilmington,	Del.	N. B. Danforth.
Dreher, John Howard,	Ashland,	Pa.	R. J. Williams.
Dubell, Alex.,	Mt. Holly,	N. J.	R. C. Barrington, M D.
Eason, David Clark,	Brookville,	Pa.	Shinn & Baer.
Eckels, Frank Huston,	Mechanicsburg,	Pa.	C. A. Eckels.
Entwistle, Albert Henry,	Philadelphia,	Pa.	Chas. H. Roberts.
Estlack, Walter Forrest,	Philadelphia,	Pa.	H. W. Estlack.
Evans, Abner Thos.,	Greensburg,	Pa.	S. P. Brown.
Evans, Samuel, Jr.,	Circleville,	O.	Evans & Kimmel.
Farrow, Fred. Reeves,	Leipsic,	Del.	Eberly Bros.
Faulhaber, Gustave Adolph,	Loudonville,	O.	S. H. Shull.
Felty, Harvey Long,	Palmyra,	Pa.	A. C. Hersh.
Fenner, Harvey Albert,	S. Bethlehem,	Pa.	Campbell & Bro.
Fisher, Samuel Keim,	Lititz,	Pa.	James C. Brobst.
Fleming, John Halbert,	Collamer,	Pa.	A. W. Smedley, dec'd.
Fletcher, Wm, Ridings,	Philakelphia,	Pa.	R. Powers Wilkinson.
Foltz, Edgar Sam'l Grant,	Bethlehem,	Pa.	N. B. Danforth.
Ford, Edward Frank,	Chester,	Pa.	F. E. E. Hudson.
Fortson, Sam'l Anthony,	Washington,	Ga.	J. G. Wright.
Foster, Wm Newell,	Philadelphia,	Pa.	Wm. H. Saurer.
Fox, Wm. Newton,	Gettysburg,	Pa.	J. G. Wells.
Friebely, Harry Eugene,	S. Bethlehem,	Pa.	H. A. Burkhart, M.D.
Frutchey, Geo. Watson,	Boorton,	N. Y.	Chas. S. Norris & Co.
Funches, Cardoza Marion,	Rowesville,	N. C.	J. M. Hillon.
Funk, Clifford Altamont,	Lancaster,	Pa.	J. A. Miller.
Funk, Robert Rowland,	Hagerstown,	Md.	Blew & Lucas.
Gage, Porcius Silkman,	Vineland,	N. J.	
Garrison, Joseph Miller, Jr.,	Elmer,	N. J.	Theodore Campbell.
Geiger, Edward Geo.,	Peoria,	Ill.	F. H. Vonachen.
Gerhardt, Carl,	Altoona,	Pa.	Jos. A. McKee.
Gibb, Andrew,	Lock Haven,	Pa.	W. C. Franciscus.
Gladhill, James White,	Jersey Shore,	Pa.	G. M. Beringer.
Godshall, Samuel R.,	Soudertown,	Pa.	Smith, Kline & French Co.
Grakelow, Ralph,	Tower City,	Pa.	I. P. Amick.
Grausam, Nicholas Jacob,	Wilkes-Barre,	Pa.	Wenner & Co.
Greenamyer, Byron Leroy,	East Palestine,	O.	E. Greenamyer, M.D

Name.	*Place.*	*State.*	*Preceptor.*
Greenamyer, Chas. Harry,	Alliance,	O.	Cassaday Drug & Chem.
Griffith, Oliver Brownback,	Uwchland,	Pa	Chas. A. Smith.
Groff, Harry Musselman,	Lancaster,	Pa.	Warrington & Pennypacker.
Groff, Wm.,	Quarryville,	Pa.	T. M. Rohrer, M.D.
Grunden, Percival Edward,	Steelton,	Pa.	G. A. Gorgas.
Guth, Herbert Wallace,	Allentown,	Pa.	Peters & Smith.
Haines, Samuel Wolston,	Camden,	N. J.	F. S Macpherson.
Handel, John Conrad,	Philadelphia,	Pa.	D. J. Weidner.
Hassenplug, Albert Winthrop,	Mifflinburg,	Pa.	J. C. Hayes.
Haus, Ralph Leonard,	Mifflinburg,	Pa.	W. H. F. Vandegrift.
Hebden, Wm.,	Philadelphia,	Pa.	C. Scattergood.
Heckeroth, Wm. Conard,	Philadelphia,	Pa.	Special Chemistry.
Heintzelman, August,	Philadelphia,	Pa.	J. A. Heintzelman.
Helmbold, Anna Palmer,	Philadelphia,	Pa.	F. W. E. Stedem.
Herbuveaux, Jules,	Utica,	N. Y.	J. H. Sheehan & Co.
Heverly, Fred. Chase,	Wilkes-Barre,	Pa.	R. D. Williams.
Hixson, Jesse Lee,	Crystal Spring,	Pa.	R. H. Lackey.
Hoffman, Wm. Anthony,	Renovo,	Pa.	John P. Frey.
Howard, Horace Emory,	South Hadley,	Mass.	J. J. Ottinger.
Huber, Wm.,	Atlantic City,	N. J.	Nelson Ingram, M.D.
Hudson, Harry, Jr.,	Philadelphia,	Pa.	
Huntington, Joseph,	Philadelphia,	Pa.	J. C. Perry.
Ingling, Howard Edgar,	Riverton,	N. J.	J. M. Cowperthwaite.
Jacobs, John Taylor,	Wilmington,	Del.	J. P. Williams.
Jaeger, Chas. Fred.,	North Adams,	Mass.	E. E. Bortick.
Jefferis, David Strode,	Philadelphia,	Pa.	Funk & Groff.
Jenkins, Frank Hieston,	Hanover,	Pa.	J. L. Emlet
Joffe, Jacob Leopold,	Kovna,	Russia,	E. J. Lupin.
Johnson, Walter Ernest,	Staunton,	Va.	
Joline, Fred.,	Par s,	France,	Dr. Merritt.
Jolly, John James,	Philadelphia,	Pa.	F. M. Apple.
Kain, John Kauffman,	York,	Pa.	J. B. Kain, M.D.
Keen, Geo. Carl,	Vineland,	N. J.	J. J. O tinger.
Keen, Geo. Samuel Jacob,	Wiconisco,	Pa.	C. D. Christman, M.D.
Keenan, John Joseph,	Philadelphia,	Pa.	J J. Burke, M.D.
Keim, Joseph Paxson,	Bristol,	Pa.	Emlin Martin.
Kepner, Weldon Stover,	Shippensburg,	Pa.	J. C. Attick & Co.
Kilpatrick, Albert Andrew,	Philadelphia,	Pa.	C. M. Hallowell.
King, James David,	Easton,	Pa.	Rowland Willard.
Kintzer, Harry Augustus,	Wolmelsdorf,	Pa.	F. T. Landis.
Kirby, Frank Brennand,	Philadelphia,	Pa.	Lawson C. Funk.
Kohl, Geo. Michener, Jr.,	Jenkintown,	Pa.	T. C. Cottman.
Krewson, Chas. Merrill,	Philadelphia,	Pa.	Geo. S. R. Wright.
Krewson, Wm. Egbert, Jr.,	Philadelphia,	Pa.	Wm. E. Krewson.
Kyser, Geo. Herbert,	Richmond,	Ala.	G. W. Kyser, M.D.
Langham, John Williams,	Philadelphia,	Pa.	E. B. Kyle.
Latchford, Orwan Luther,	Markelsville,	Pa.	D. H. Ross.
Lee, Walter Evan,	Vineland,	N. J.	Bidwell & Co.
Lefever, John Matthew,	York,	Pa.	S. M. Gable.
Lehman, Chas. Luther,	Boiling Springs,	Pa.	R. T. Blachwood.
Lerch, Wm. Abraham,	Allentown,	Pa.	Peters & Smith.
Levy, Joseph Jacob,	Philadelphia,	Pa.	I. B. Amick, M.D.
Liebert, Chas. Fred.,	Philadelphia,	Pa.	A. G. Keller.
Lightcap, Wm. Edward,	Smyrna,	Del.	G. M. Beringer.
Lindig, Chas. Warren,	Lewisburg,	Tenn.	H. N. Hoffman.
Lippincott, David Alfred, Jr.,	Burlington,	N. J.	H. B. Weaver.
Longshaw, Thos. Elmer,	Philadelphia,	Pa.	J. B. Moore.
Luebert, August Gustav,	Philadelphia,	Pa.	David A. Over.
MacBride, Wm. Vaughan,	Philadelphia,	Pa.	W. F. Seiler.

Name.	*Place.*	*State.*	*Preceptor.*
McCleary, Harry Walter,	Pine Grove,	Pa.	J. E. Sipe.
McCurdy, Edgar,	Philadelphia,	Pa.	Healy & Frey.
McDonnell, Joseph Francis,	Centralia,	Pa.	C. F. Chandler, M.D.
McGarrah, Wm. Henry, Jr.,	Scranton,	Pa.	F. W. E. Stedem.
McIntyre, Andrew James,	Catasauqua,	Pa.	E. L. Klopp & Co.
McKeown, Geo. Washington,	Philadelphia,	Pa.	Wm. Mann.
MacNair, Hugh,	Jarratt,	Va.	Lawson C. Funk.
Mahoney, James Norris,	Bridgeport,	Pa.	F. E Himmelwright, M.D.
Malin, George Lawrence,	Atlantic City,	N. J.	Willard Wright, dec'd.
Markley, Harry Genet,	Camden,	N. J.	Harry Guest.
Mathers, Grace,	Philadelphia,	Pa.	Susan Hayhurst, M.D.
Metzler, Walter Scott,	Baltic,	O.	A. S. Metzler.
Middleton, Claud Ruoff,	Philadelphia,	Pa.	Shinn & Baer.
Miller, George Washington,	Lancaster,	Pa.	George W. Hull.
Miller, Wm. Fred.,	Erie,	Pa.	Wm. Fischer.
Mills, Leopold John,	Cardington,	O.	H. S. Mooney.
Moeckel, Raymond Light,	Lebanon,	Pa.	V. H. Allwein, M.D.
Monaghan, Thos. Francis,	Philadelphia,	Pa.	H. D. Stickter, M.D.
Monroe, William Robeson,	Fresno,	Cal.	George H. Monroe.
Moore, Fred. Smith,	Wilmington,	Del.	Beacon Dispensary.
Morell, Charles Joseph,	Philadelphia,	Pa.	Charles M. Morell.
Morgan, Francis Wm.,	Pass Christian,	Miss.	Wm. Greve.
Morse, Thomas,	Montgomery,	Ala.	H. G. Eakin.
Ney, Howard Jacob,	Hamburg,	Pa.	C. F. Kramer.
Nixon, Robert Brighton, Jr.,	Mifflintown,	Pa.	M. P. Crawford.
Obear, Josiah Julian,	Winsboro,	S. C.	O. Y. Owings.
Otto, Glenn Frazier,	LaCrosse,	Wis.	Oscar Houck
Parry, Edward,	N. Cramer Hill,	N. J.	W. H. Hensinger, M.D.
Parry, Wm. Hough,	Newtown,	Pa.	J. S. Brown.
Parse, Andrew Connet,	Flemington,	N. J.	J. Sherman Coley.
Parvin, John Pearson,	Reading,	Pa.	W. F. Potteiger.
Pasold, Julius Martin,	Joliet,	Ill.	H. F. Voshage.
Pearce, Samuel Robert,	Manasquan,	N. J.	Andrew Blair.
Pechin, Edward Charles,	Philadelphia,	Pa.	G. J. Pechin.
Peck, Wm.,	Nottingham,	England,	A. R. Hesske.
Perse, James Woodlock,	Plymouth,	Pa.	James V. Perse.
Pettebone, Thomas J.,	Dorranceton,	Pa.	C. W. Spayd, M D.
Phillips, John Henry,	Redfield,	N. Y.	Wm. H. Phillips.
Pierce, John Jeremiah,	Sanford,	Pa.	F. E. Geuther.
Pipes, William Henry,	Millington,	Md.	
Prosser, David Davis, Jr.,	Hellertown,	Pa.	J. Howard Evans, M.D.
Putt, Milton Thos.,	Lebanon,	Pa.	W. B. Means, M.D.
Raker, John Wilson,	Pillow,	Pa.	Chas. H. Tatem.
Randolph, Edward Fitts,	Plainfield,	N. J.	L. W. Randolph.
Rankin, James Lockhart,	Jacksonville,	Fla.	W. K. Lits.
Remmel, Geo. Swartz,	Port Royal,	Pa.	F. Ross Hamer.
Ressler, Harvey Elwood,	Martinsburg,	Pa.	Chas. H. Clark.
Rich, Benj. Howard,	Bellefonte,	Pa.	W. C. Keplinger & Co.
Richardson, James,	Pickering,	Canada,	Geo. Y. Wood.
Ringer, Lewis Johnson,	Hagerstown,	Md.	M. L. Byers.
Rinker, Henry Paul,	Hellertown,	Pa.	C. W. Albright.
Ritter, Edwin Sterner,	Richlandtown,	Pa.	Smith, Kline & French Co.
Ritz, Chas. August,	Ashland,	Pa.	A. Schoenenberger.
Robbins, Edward Cruise,	Glassboro,	N. J.	F. G. Thomas.
Robert, De Wilton Smith,	Norristown,	Pa.	O. F. Lenhardt.
Rolland, Geo. Hegarty,	Edinburgh,	Scotland,	E. F. Backmann, M.D.
Rose, Frank,	Philadelphia,	Pa.	G. W. Brown, M.D.
Ross, Annie Catherine,	Philadelphia,	Pa.	W. E. Supplee.
Rowe, Thos. Maurer,	Reading,	Pa.	B. A. Hertsch.

Name.	*Place.*	*State.*	*Preceptor.*
Rutherford, John Burton,	Philadelphia,	Pa.	Chas. A. Rutherford.
Sausser, Howard Elmer,	Schuylkill Haven,	Pa.	John B. Raser.
Schaffer, Chas. Abraham,	Berlinsville,	Pa.	J. A. Weigner.
Schembs, Peter Joseph,	Philadelphia,	Pa.	C. E. Hewitt, M.D.
Scheuhing, John B.,	Shenandoah,	Pa.	F. W. E. Stedem.
Schlauch, Theodore Storb,	New Holland,	Pa.	Chas. J. Sether.
Scott, Thornton, T. B.,	Philadelphia,	Pa.	J. R. Smyser.
Sechler, LeRoy Rote,	Danville,	Pa.	Arthur S. Hollopeter.
Seiberling, Jos. D ,	Hynemanville,	Pa.	Frank Morse.
Seubert, Chas. Aloysius,	Lebanon,	Pa.	John F. Loehle.
Shafer, Wm. Addison,	Montoursville,	Pa.	E. C. Shafer.
Shaw, John Thomas,	Philadelphia,	Pa.	Joseph Crawford.
Sheehan, Wm. Henry,	Philadelphia,	Pa.	Harry M. Campbell.
Sheetz, Horace Eban,	Philadelphia,	Pa.	F. J. Voss, M.D.
Sheitz, Lloyd A.,	York,	Pa.	Harry A. Hay.
Shemp, Russell Nicholas,	Philadelphia,	Pa.	W. E. Supplee & Bro.
Shwab, Geo. Augustus,	Nashville,	Tenn.	
Sieber, Isaac Grafton,	Harrisburg,	Pa.	J. Wilson Hoffa.
Slobodkin, Rose,	Minsk,	Russia,	Susan Hayhurst, M.D.
Smiley, Geo. Washington,	Philadelphia,	Pa.	E. R. Smiley, M.D.
Smiley, Laura Marguerite,	Philadelphia,	Pa.	E. R. Smiley, M D.
Smith, Alfred Logan,	Smyrna,	Del.	Wm. F. Dunn.
Smith, Benjamin James,	Trenton,	N. J.	James Hinkley.
Smith, Cyrus Edward,	Philadelphia,	Pa.	H. A. Smith.
Snavely, Clarence Osborne,	Lebanon,	Pa.	Wm. G. Shugar.
Snyder, Harry Lamar,	Annandale,	N. J.	A. Spengler.
Snyder, John Paul,	Lancaster,	Pa.	W. T. Hock.
Sprout, Warren Austin,	S. Williamsport,	Pa.	J. Paul Suess.
Spurr, Thos. Andrew,	St. Clair,	Pa.	Milton S. Apple.
Stackhouse, Joseph Albert,	Bristol,	Pa.	Jesse W. Pechin.
Steinmetz, Wm. Baer,	Ephrata,	Pa.	G. S. Royer.
Stevens, Zebedee,	Philadelphia,	Pa.	A. B. Kennedy.
Stillwagon, Oscar Hulet,	Ambler,	Pa.	Jos. S. Angeny, Jr.
Stimus, Howard Geo.,	Moorestown,	N. J.	G. H. Wilkinson.
Stokien, Francis Joseph,	Charleston,	S. C.	
Stott, Horatio Allen,	Coatesville,	Pa.	W. S. Young.
Strawinski, Jacob Frank,	York,	Pa.	Dale, Hart & Co.
Swartley, Harry Mahlon,	Philadelphia,	Pa.	F. P. Streeper,
Swartz, Stanley Benjamin,	Park Place,	Pa.	John A. Weaver.
Swinehart, Daniel Harris,	Pottstown,	Pa.	L. L. Shuler.
Taylor, Howard Walter,	Clifton Heights,	Pa.	J. J. McFadden.
Thomas, Frank Hartwell,	Valdosta,	Ga.	
Thompson, Henry Kirk,	Titusville,	Pa.	E. K. Thompson & Son.
Thompson, Harry Merrill,	Selin's Grove,	Pa.	J. M. Wallis, M D.
Thornton, Michael Thos.,	Ashland,	Pa.	J. A. Antill, M.D.
Tomlinson, Geo. Walton,	Rydal,	Pa.	S. T. Hamberg.
Townsend, Wm. Sidney,	Pocomoke City,	Md.	H. N. Willis, M.D.
Troth, Ernest Augustine,	Palmyra,	N. J.	Shoemaker & Busch.
Troxell, John Isaac Peter,	Allentown,	Pa.	I. E. Bennett, M.D.
Tucker, Stephen Allan,	Pembrooke,	Ontario,	Special Chemistry.
Twist, Oliver.	Trenton,	N. J.	Oscar Davison.
Tyler, Wm. Walston,	Onancock,	Va.	Geo. B. Evans.
Underwood, James Harris,	Woodbury,	N. J.	H. M. Brennan.
Waldner, Herman Theodore,	Ashland,	Pa.	Theo. H. Strouse.
Walter, Wm. Bell,	Gettysburg,	Pa.	H. C. Blair.
Watson, Joseph Shaffer,	Mt. Holly,	N. J.	W. F. Simes' Son.
Wells, Raymond Reid,	Columbus,	N. J.	A. N. Dobbins.
Wenrich, Wm. Paul,	Edgehill,	Pa.	W. E. Donough, M.D.
White, Wm. Clements,	Crawfordsville,	Ind.	Wm. F. Lytle.

Name.	*Place.*	*State.*	*Preceptor.*
Wild, Geo.,	Johnstown,	Pa.	Special Chemistry.
Wilson, Albert Emory,	Washington Borough,	Pa.	T. R. Gossling.
Wilt, Geo. Washington, Jr.,	Flemingsburgh,	Ky.	John J. Reynolds.
Winkler, Oscar Chas.,	Philadelphia,	Pa.	Christian Weiss.
Winslow, John Hayes,	Vineland,	N. J.	A. C. Taylor.
Wiseman, Walter Harry,	Philadelphia,	Pa.	E. A. Perrenot.
Wismer, Isaac Gross,	Philadelphia,	Pa.	E. T. Spencer.
Wiza, Joseph Louis,	Philadelphia,	Pa.	A. A. Poehner.
Wood, Jonathan Howard,	Norristown,	Pa.	McClure, Heritage & Co.
Wooten, Frank Marion,	La Grange,	N. C.	G. L. Wooten.
Wright, Joseph,	Easton,	Md.	Dawson & Jenkins.
Yates, John Julius, Jr.,	Wilmington,	Del.	H. K. Watson.
Young, Asa Harvey,	Easton,	Pa.	Mebus & Richards.
Zane, Wm. Spence, Jr.,	Seabright,	N. J.	Geo. B. Minton.
Zimmerman, Thos. Edward,	Carlisle,	Pa.	D. F. Emrick.

SENIOR CLASS.

Albaugh, Herbert Spencer,	Covington,	O.	A. C. Schofield.
Alexander, Chas. Ellis,	York,	Pa.	G. W. Fulmer.
Alsop, John W.,	Tremont,	Pa.	G. P. Schuhle.
Armstrong, Walter,	Lantz Mills,	Va.	Lawson C. Funk.
Arndt, Harry, Jr.,	Manheim,	Pa.	H. F. Ruhl.
Ashmead, Alfred Elliott,	Philadelphia,	Pa.	B. P. Ashmead.
Aszmann, Louise Henrietta,	Marburg,	Germany,	H. L. Smith.
Baer, Hermanus Ludwig,	Somerset,	Pa.	John N. Snyder.
Bahe, Wm. F.,	Chicago,	Ill.	W. A. Brabrook.
Baker, Newton Claire,	Watsontown,	Pa.	Chas. Leedom.
Baldauf, Leon Kahn,	Henderson,	Ky.	J. L. Baldauf.
Barbiere, Francis Joseph,	Philadelphia,	Pa.	W. R. Warner & Co.
Barrett, Wesley Johnson,	Downingtown,	Pa.	Jas. A. Walmsley, M.D.
Bartho, Fremont Kessler,	Sacramento,	Pa.	L. K. Sli'er.
Bartlett, Hannah Frances,	Vineland,	N. J.	Susan Hayhurst, M.D.
Becht, Frederick,	Philadelphia,	Pa.	A. R. Lawson.
Beckett, Josiah Bee,	Woodbury,	N. J.	A. S. Marshall.
Beeler, Aaron Wilson,	Mt. Eaton,	O.	A. W. Blackburn.
Bensinger, Geo. Irvin,	Schuylkill Haven,	Pa.	C. S. Commings.
Berg, David,	Philadelphia,	Pa.	Special Chemistry.
Biddle, Louis Ames,	Philadelphia,	Pa.	M. M. Osmunn.
Bode, Theodore Christian,	Atchison,	Kans.	M. Noll.
Boose, Wm. Engelhart,	York,	Pa.	Geo. W. Fulmer.
Boyer, John Clinton,	Loyalton,	Pa.	H. C. Eddy.
Breithaupt, Alphons Peter,	Philadelphia,	Pa.	C. A. Werckshagen.
Bremer, Albert Herman,	Philadelphia,	Pa.	M. Sontagg.
Brown, Roscoe James,	Oxford,	Pa.	E. E. DeGrofft, M.D.
Brugler, Elmer Geo.,	Bloomsburg,	Pa.	H. C. Blair.
Buehler, David Alexander,	Gettysburg,	Pa.	L. M. Buehler.
Buss, Marcus,	S. Bethlehem,	Pa.	M. M. Buss.
Cameron, Chas. Sherwood,	Rising Sun,	Md.	L. R. Kirk, M.D.
Campbell, Frank Book,	Leetonia,	Ohio,	F. W Wiedemayer.
Carson, James Thompson,	Philadelphia,	Pa.	Dr. Meredith.
Carstens, Louis Peter,	Davenport,	Iowa,	Gust. Schlegel & Son.
Case, Luella,	Delaware,	Ohio,	Francis M. Starr.
Cassel, James Wilson,	North Wales,	Pa.	Wm. R. Childs.
Catherman, Isaac Newton,	Selin's Grove,	Pa.	G. C. Wagenseller.
Chalfant, Chas. Joshua,	Unionville,	Pa.	E. D. MacNair & Bro.

Name.	*Place.*	*State.*	*Preceptor.*
Clair, Joseph Sylvester,	Pointville,	N. J.	J. L. Curry.
Clapp, Sam'l Clarence, Jr.,	Milton,	Pa.	C. E. Stout.
Clark, Edward,	Reading,	Pa.	F. X. Wolf.
Cloud, Norman Henderson,	West Chester,	Pa.	Luther Gerhard.
Codori, Simon Jacob, Jr.,	Gettysburg,	Pa.	J. M. Hillan.
Coller, Wm. Warner,	Reading,	Pa.	W. F. Potteiger.
Collings, Walter Nagle,	Philadelphia,	Pa.	Special Chemistry.
Collins, John Hall,	Philadelphia,	Pa.	R. C. Cadmus.
Comber, David Joseph,	Philadelphia,	Pa.	Joseph Healy.
Conover, Arthur Bruce,	Dayton,	Ohio,	C. H. Breidenbach.
Cooper, Morris,	Fredericksburg,	Pa.	J. H. Garman.
Cope, Edward Kreidler,	Philadelphia,	Pa.	F. H. Cope.
Corne l, Horace Hogeland,	Newtown,	Pa.	Robert Glenk.
Craig, James,	Glasgow,	Scotland,	F. H. Davis.
Craig, Ralph Butz,	Allentown,	Pa.	F. F. Thomson.
Crayton, Frank Blair,	Anderson,	S. C.	Simpson & Son.
Criswell, Edward Ott,	Waynesboro,	Pa.	J. W. Harrigan.
Crumbie, James Henry,	Philadelphia,	Pa.	Geo. J. Crumbie.
Daniels, Chas Rockford,	Columbia,	S. C.	H. C. Blair.
Davis, John Ellsworth,	Salem,	N. J.	W. H. Dunn.
Deane, Chas. Howard,	Wilmington,	Del.	J. M. Harvey.
Deemer, Geo. Morton Hays,	Greensburg,	Pa.	J. V. Stephenson.
De Graffe, Bertha Leon,	Albany,	N. Y.	Otto deKieffer.
Deibert, Wm. Henry,	Northampton,	Pa.	J. H. Stermer.
Dewees, Wm. Holstein,	Philadelphia,	Pa.	McClure, Heritage & Co.
Dickinson, Chas. Seymour,	Erie,	Pa.	E. J. Wood.
Dietrich, Pierce Abbott,	Kutztown,	Pa.	A. S. Butz, M.D.
Dill, Benjamin,	Philadelphia,	Pa.	W. E. Lee.
Draper, Oscar Carman,	Wilmington,	Del.	W. C. Taylor.
Dreifoos, Benjamin Franklin,	Reading	Pa.	J. Moffet.
Dutt, Wm.,	Akron,	Ohio,	E. H. Buell.
Ehman, Joseph Wm.,	Williamsport,	Pa.	S T. Hamberg.
Elliott, Boyce,	Winnsboro,	S. C.	W. E Aikin, M.D.
Elliott, James Troxell,	Gettysburg,	Pa.	J. M. Huber.
Eschbach, Clarence Derbie,	Milton,	Pa.	J. S. Follmer.
Failing, Wm. Clark,	Palatine Bridge,	Pa.	H. C. Blair.
Farley, Levi James,	Chester,	Pa.	Wm. H. Farley.
Farrell, Martin Edward,	Centralia,	Pa.	W. H. Read, M.D.
Felker, Harry,	S. Bethlehem,	Pa.	W. B. Gleim.
Few, Colin Spangler,	Middletown,	Pa.	J. D. McFerren.
Field, Claud,	Indianapolis,	Ind.	Special Chemistry.
Fischer, Fred. Franklin,	Philadelphia,	Pa.	E. C. Vogelbach.
Flenniken, John Byron,	Uniontown,	Pa.	Frank Huston.
Flitcraft, Warren Whitney,	Woodstown,	N. J.	Special Chemistry.
Fluck, Franklin Wilson,	Allentown,	Pa.	Peters & Smith.
Freeman, Josiah Kisterboch,	Philadelphia,	Pa.	Rush P. Marshall.
Gabriel, Robert Rudolph,	Philadelphia,	Pa.	D. H. Ross.
Garcia, Juan Reyes,	Porto Rico,	W. I.	R. C. Martin.
Geiger, Walter Sam'l,	Reading,	Pa.	J. C. Griesemer.
Genz, Geo. Leonard,	Hazel Green,	Wis.	T. McNeill.
Gessford, Otice Eugene,	Lippincott,	Pa.	Funk & Groff.
Godfrey, Swain Townsend,	Seaville,	N. J.	Geo. J. Pechin.
Goldsmith, Lee,	Philadelphia,	Pa.	Harry Weiss & Co.
Good, Robert Franklin,	Allentown,	Pa.	J. C. Biddle.
Goodfellow, Chas. Rumney,	Philadelphia,	Pa.	E. M. Wallington & Co.
Gowen, Clarence Blain,	Brunswick,	Ga.	Special Chemistry.
Graham, Harry Edgar,	Chambersburg,	Pa.	J. S. Barnitz.
Greer, Mary Caroline,	Darby,	Pa.	H. M. Richardson, M.D.
Gross, Paul Herbert,	York,	Pa.	R. Wm. Ziegler.

Name.	Place.	State.	Preceptor.
Haines, Chas. Henry,	Rising Sun,	Md.	Theo. Campbell.
Hall, Robert Carson,	Kane,	Pa.	J. B. Cochran & Co.
Hamilton, Wm. Hamsher,	Shippensburg,	Pa.	J. C. Attick & Co.
Hance, Geo. Headley,	Philadelphia,	Pa.	H. A. Hance.
Hannan, Frank Wm.,	Johnstown,	Pa.	Chas. Griffith.
Harlow, Chas. Mills,	Wyncote,	Pa.	F. W. Brown Co.
Harmon, Geo. Alvin,	Machiasport,	Me.	C. Longfellow.
Harrell, Herbert Dean,	Wheeling,	W. Va.	Geo. H Ebeling.
Harris, Clarence Mulford,	Bridgeton,	N. J.	C. S. Ogden.
Harry, Hamilton Maxwell,	Conshohocken,	Pa.	James W. Harry.
Haymaker, Milo Miller,	Warrensburg,	Mo.	H. L. Barber.
Hayman, Walter,	Turbotville,	Pa.	Chas. L. Lashelle, M.D.
Heckerman, Adam Bruce,	Bedford,	Pa.	M. P. Heckerman.
Heffner, Edgar Franklin,	Centralia,	Pa.	Chas. L. Lashelle, M.D.
Heim, Christian,	Philadelphia,	Pa.	Henry Mueller.
Heinbach, Frank Walton,	St. Clair,	Pa.	J. L. D. Morison, M.D.
Helfrich, Edward Daniel,	Galion,	O.	H. G. Hackedorn.
Hellyer, Edwin Fayette,	Penns Park,	Pa.	James Huston.
Hendrickson, Wm. Randolph,	Swedesboro,	N. J.	H. E. Jones.
Herbert, Wm. Chas.,	Millstadt,	Ill.	Fred. Rose, M.D.
Herzog, Albert,	Washington,	Mo.	E. W. Gallenkamp.
Hiffmeyer, Wm. Joseph,	York,	Pa.	Wm. Smith & Co.
Hildebrand, Howard Ovid,	York,	Pa.	A. H. Lafean & Bro.
Hill, Wm. Maurice,	Lansford,	Pa.	Wm. M. Hill.
Hippler, Harry Richmond,	Philadelphia,	Pa.	W. C. Bichy.
Hodil, Frank Dilworth,	Sligo,	Pa.	J. R. Murray.
Hoffman, Wm. Shalter,	Danville,	Pa.	Geo. C. Devine, M.D.
Holt, James Stephen,	Philadelphia,	Pa.	J. D. McFerren.
Hörst, Harry Lewis,	Lock Haven,	Pa.	T. C. Hilton & Co.
Howell, Harry Field,	Easton,	Pa.	Geo. B. Evans.
Hukill, Oscar K.,	Hot Springs,	Ark.	Andrew Blair.
Humpton, Albert Norton,	Philadelphia,	Pa.	H. G. Kalmbach.
Hundertmark, John Chas.,	Cleveland,	O.	Acker Bros.
Hunt, Warren Ernest,	Philadelphia,	Pa.	J. C. Perry.
Ink, Chas. Thos.,	Columbiana,	O.	Chas. E. Ink.
Jackson, Thos.,	Philadelphia,	Pa.	L. W. Hildenbrand, M.D.
Jacoby, Chas. Nicholas,	Fond du Lac,	Wis.	J. T. Dana.
Jacoby, Wm. Lawless,	Philadelphia,	Pa.	Bullock & Crenshaw.
James, Robert Rosser,	Scranton,	Pa.	C. R. Shryer.
Janisch, Fred. Wm.,	Philadelphia,	Pa.	E. Jungmann.
Jennings, Isaac Astor,	Philadelphia,	Pa.	
Johns, Frank James,	Pleasant Mount,	Pa.	W. P. Wingender, M.D.
Johnson, Albert Burtis,	Point Pleasant,	N. J.	S. L. Carroll.
Johnson, Charlton Graham,	Columbus,	Ga.	Evans & Howard.
Johnson, Olive Curtis,	Danville,	Pa.	S. Y. Thompson, M.D.
Jones, Lester David,	Manchester,	Ia.	Wm. Procter, Jr. Co.
Kaye, Emma Louisa,	Philadelphia,	Pa.	John Kaye, M.D.
Kelchner, Charles Eber,	Bloomsburg,	Pa.	Geo. P. Ringler.
Kelley, Alfred Logan,	Wilmington,	Del.	Garrett S. Smith.
Kessler, Lawrence Anthony,	Logan,	O.	E. F. Kessler.
Ketterer, Martin,	Philadelphia,	Pa.	Max Sonntag.
Killiam, Wm. Smith,	Wilmington,	Del.	N. B. Danforth.
Kirlin, Chas. Coleman Hagenbach,	Shenandoah,	Pa.	P. P. D. Kirlin.
Kline, Frank,	Reading,	Pa.	A. Schaich.
Knoefel, Arthur Eugene,	Louisville,	Ky.	Knoefel & Knoefel.
Koehler, George,	Philadelphia,	Pa.	E. F. Koempfer.
Kramer, Geo. Henry,	Philadelphia,	Pa.	Robert McNeil.
Kunz, Chas. Cornelius,	Philadelphia,	Pa.	P. P. Klopp.
Kupfer, John Harry Joseph,	Butte City,	Mont.	C. W. Newton, M.D.

Name.	*Place.*	*State.*	*Preceptor.*
Lachenmayer, Henry Julius,	Philadelphia,	Pa.	Robert Shoemaker & Co.
Laughlin, Albert Russell,	Newville,	Pa.	B. F. Emrick.
Laucks, Wm. Irwin,	Upper Bern,	Pa.	Warren H. Poley.
Lautenbacher, Wm. Roth,	Tamaqua,	Pa.	
Lee, Henry Francis,	Port Kennedy,	Pa.	Funk & Groff.
Leech, David Malcolm,	Philadelphia,	Pa.	George Freshell.
Lenhart, Enos Samuel,	Philadelphia,	Pa.	G. L. Carnan.
Le Sage, George Lewis,	Fulton,	N. Y.	Wm. Wilson.
Leslie, Harry Carter,	Susquehanna,	Pa.	H. E. Outwater.
Levan, Walter,	Numidia,	Pa.	J. E. Gregory.
Lewis, Daniel Wm.,	Vineland,	N. J.	Wm. H. Faunce.
Lewis, Howard Hornberger,	Reading,	Pa.	G. L. Dengler.
Light, James Raymond,	Lebanon,	Pa.	Geo. W. Schools.
Lincoln, Geo. Washington,	Philadelphia,	Pa.	H. G. Shinn.
Littlefield, Bradford Allen,	Watertown,	N. Y.	E. C. Van Namee.
Lloyd, Ephraim Augustus,	Wilmington,	Del.	A. D. Cuskaden, M.D.
Long, Harvey,	Middletown,	Pa.	W. A. Burns, M.D.
Longmire, Chas. Henry,	Philadelphia,	Pa.	F. P. Reidenauer.
Luhr, Frederick A.,	St. Mary's,	Pa.	A. Millhaupt, M.D.
Lukens, Chas. Baker,	Philadelphia,	Pa.	D. A. Over.
McCracken, James Henry,	Darby,	Pa.	Harlan Cloud.
McGehee, Hanford Bell,	Staunton,	Va.	Lawson C. Funk.
McHenry, Walter Greenleaf,	Philadelphia,	Pa.	Aquila Hoch.
McLaughlin, Chas. Bishop,	Millville,	N. J.	A. H. Lippincott, M.D.
McNeil, Thos. Hunter,	Philadelphia.	Pa.	R. C. McNeil.
Maples, Murff Ford,	Pueblo,	Col.	A. C. Daniels.
Marshall, Chas. Gross,	West Fairview,	Pa.	R. C. Marshall, M.D.
Matusdow, Harry,	Minsk,	Russia,	C. H. Bohn.
Meier, August Joseph,	Aldenburg,	Germany,	G. J. Crumbie.
Meredith, Chas. Howard,	Media,	Pa.	Wm. E. Dickeson.
Metz, Abram Lehman,	Chambersburg,	Pa.	C. B. Lowe, M.D.
Metzler, Claude Dallas,	Harrisonville,	Pa.	Jas. A. Ferguson.
Meyers, George Henry,	Bryansville,	Pa.	H. F. Backenstoe.
Miller, Chas. Glanz,	Easton,	Pa.	George B. Evans.
Miller, James Augustus,	Eddyville,	Ia.	W. A. Alexander.
Miller, John Henry,	Ephrata,	Pa.	Alonzo Robbins.
Montgomery, John Custis,	Chambersburg,	Pa.	P. B. White.
Moore, Geo. Cooper,	Felton,	Del.	J V. Slaughter.
Morgan, Clayton Edward,	Philadelphia,	Pa.	Frank E. Morgan.
Mosebach, Ferdinand Adam,	Bethlehem,	Pa.	G. H. Ochse.
Mountaine, Wm. Lewis,	Bangor,	Me.	L. L. Alden & Co.
Mueller, Chas. August,	Philadelphia,	Pa.	A. G. Keller.
Musselman, John,	Strasburg,	Pa.	R. W. Cuthbert.
Nailor, Elmer Byard,	Wilmington,	Del.	W. E. Smith.
Nebel, Chas. Wm.,	Philadelphia,	Pa.	A. S. Hollopeter.
Neville, Wm.,	Conshohocken,	Pa.	
O'Donnel, David Howard,	York,	Pa.	B. S. Gilbert.
Page, Edward Lewars,	Lancaster,	Pa.	Shinn & Baer.
Parke, John Siter,	Philadelphia,	Pa.	Chas. H. Tatem.
Peiffer, Chas. Oscar,	Morton,	Pa.	A. R. Morton, M.D.
Pennell, Jerome Chester,	Bridgeton,	N. J.	J. S. Supplee.
Peterson, Walter Vickerstaff,	Philadelphia,	Pa.	C. W. Shull.
Phillips, Wm. Newton,	Zanesville,	Ohio,	H. Sunderland, M.D.
Pierce, Herman Judson,	Troy,	Pa.	R. F. Redington.
Pierson, Wm. Harry, Jr.,	Wilmington,	Del.	J. S. Beetem.
Pilgrim, John W.,	Bridgeton,	N. J.	A. W. Cochran.
Place, Chas. Ross,	Stroudsburg,	Pa.	Jos. M. Kerr.
Portser, Chas. Henry,	Saltsburg,	Pa.	H. C. Watt, M.D.
Post, Edward Meigs,	S. Seaville,	N. J.	A. S. Buchanan.

Name.	*Place.*	*State.*	*Preceptor.*
Praul, Walter Francis,	Philadelphia,	Pa.	J. H. Masholder.
Pulsifer, James Perlie,	Lakewood,	N. J.	Chas. A. Bye.
Punt, Arnold Anthony Joseph,	Philadelphia,	Pa.	W. H. Pile & Sons.
Reed, Arthur Benjamin,	Pillow,	Pa.	Thos. Hetherington.
Reese, John Bull,	Centralia,	Pa.	Geo. W. Davis.
Reeve, James Whitaker,	Philadelphia,	Pa.	N. Pennypacker.
Reid, Wm. Watts,	Halifax,	N. C.	John H. Baughman.
Reifsnyder, David Ernest,	N. Heidelberg,	Pa.	Wm. E. Donough, M.D.
Reilley, Isabella Buist,	Philadelphia,	Pa.	C. H. Gubbings, M.D.
Rewalt, Jay Wm.,	Middletown,	Pa.	J. W. Rewalt.
Richardson, Neafie,	Rio Grande,	N. J.	Geo. M. Conard, M.D.
Rieben, Ernest,	Philadelphia,	Pa.	Chas. A. Gill.
Roach, Chas. Peter,	Driftwood,	Pa.	Wm. H. Roach.
Robertson, Henry Edward, Jr.,	Philadelphia,	Pa.	Shinn & Baer.
Robinson, Raleigh,	Hatboro,	Pa.	W. Robinson, M.D.
Ross, Frank Budd,	Vincentown,	N. J.	F. S. Hilliard.
Roth, Francis John,	Lund,	Sweden,	H. B. Spackman.
Rovno, Pinkas,	Kieff,	Russia,	M. Lupin.
Rudy, Harry Robert,	Hagerstown,	Md.	D. C. Aughinbaugh.
Ryland, Geo. Bertram,	Grantsville,	Md.	J. B. Copeland.
Sager, Verner Edward,	North Bristol,	Ohio,	Andrew Blair.
Sallada, Hunter Albert,	Ashland,	Pa.	D. G. Potts.
Schabinger, Chas.,	Felton,	Del.	Wm. Harris.
Schad, Harry John,	Tamaqua,	Pa.	L. J. Steltzer.
Schaeffer, Otis Oliver,	Middletown,	Pa.	R. T. Blackwood.
Schindel, David Philip,	Hagerstown,	Md.	S. F. Schindel.
Schmalzriedt, Fred.,	Philadelphia,	Pa.	Wm. R. Warner & Co.
Schmieg, Joseph Alphonse,	Philadelphia,	Pa.	H. D. Stechter.
Schneider, Kingsley Clark Thompson,	Berea,	Ohio,	Noble & Stone.
Schnurman, Henry Samuel,	Allentown,	Pa.	G.W.Shoemaker & Co.
Schroeder, Johann Heinrich,	Bassum,	Germany,	Louis N. Bérubé.
Schumann, August Frank,	Philadelphia,	Pa.	P. G. A. Weber (dec'd).
Seipel, Harry Bertram,	Philadelphia,	Pa.	L. Seipel.
Sellers, Walter Spangler,	Chambersburg,	Pa.	Cressler & Keefer.
Semmel, Franklin Pierce, Jr.,	Lehighton,	Pa.	C. T. Horn, M.D.
Seyforth, Julius Fred.,	Leavenworth,	Kans.	Jas. F. Ross.
Sharp, Warren Reed,	West Chester,	Pa.	A. B. Hammond.
Sherwin, Robert Suthers,	Scranton,	Pa.	Chas. Henwood & Co.
Shreve, Alexander,	Wrightstown,	N. J.	Mackall Bros. & Flemer.
Simpler, Willard Eugene,	Williamsport,	Pa.	W. J. Jenks.
Smith, Justin Tone,	Windsor,	Vt.	W. A. Rumsey.
Smith, Paul,	New Berlin,	Pa.	Robert Shoemaker & Co.
Spath, Geo. Balthaser,	Dillsburg,	Pa.	H. W. Fishel.
Spotts, Albert Oyster,	Newport,	Pa.	T. E. Conard, M.D.
Stadelman, Herman R.,	Ardmore,	Pa.	H. M. Davis.
Stahel, Albert Wm.,	Roscobel,	Wis.	H. B. Morse.
Steadman, Merril Linn,	Mifflinburg,	Pa.	W. D. Heiser.
Stephens, Halsey DeForest,	Seaville,	N. J.	J. M. Ridge, M.D.
Stevens, Thos. Ray,	Bethlehem,	Ind.	Julian Fajans, M.D.
Stine, Howard F.,	Mt. Carmel,	Pa.	A. S. Jordan & Co.
Stommel, Henry Aloysius Jos.,	Doylestown,	Pa.	Edwin M. Boring.
Stout, Edward Clayton,	Quakertown,	Pa.	Geo. C. Devine, M.D.
Strayer, Otho O'Burn,	Beverly,	N. J.	A. W. Taylor, M.D.
Streeper, Austin,	Norristown,	Pa.	H. R. Stallman.
Stroup, Freeman Preston,	Rouseville,	Pa.	Wm. C. Tyler, M.D.
Stump, Adam Franklin Marshall,	Womelsdorf,	Pa.	H. G. Haring.
Swainbank, Chas. Miller,	Wilkes-Barre,	Pa.	H. H. Swainbank.
Taff, Samuel Milton,	Fayetteville,	Ark.	Chas. H. Clark.

Name.	*Place.*	*State.*	*Preceptor.*
Taggart, Geo. Cole,	Emporia,	Pa.	L. Taggart.
Test, Ellwood Allen,	Philadelphia,	Pa.	John H. Kerr.
Thompson, Alexander Peterson,	Philadelphia,	Pa.	A. Pairman.
Thrush, Morris Clayton,	Charlestown,	W. Va.	Light & Watson.
Tiefenbach, Jacob Fred.,	Easton,	Pa.	Dr. Sheets.
Toelke, Charles,	Philadelphia,	Pa.	Frank E. Morgan.
Towles, Therret Rankin,	Henderson,	Ky.	J. L. Baldauf.
Townsend, James Vaughan,	Atlantic City,	N. J.	H. B. Leeds.
Tyson, Warren Sunderland,	Norristown,	Pa.	Atwood Yeakle.
Wagner, Chas. Henry,	Ashland,	Pa.	A. Schoenenberger.
Waldner, Paul Jacob,	Philadelphia,	Pa.	Wm. Geo. Toplis.
Wasley, Fred. Stanley,	Shenandoah,	Pa.	H. Wasley.
Watkins, Mack McInnis,	Moss Point,	Miss.	O. Eastland.
Watson, Jonathan Ingham,	New Hope,	Pa.	W. K. Mattern, M.D.
Weber, Howard Elmer,	Mahanoy City,	Pa.	M. R. Stein.
Weida, Chas. Arthur,	Reading,	Pa.	John B. Raser.
Weiss, Hervey Beale,	Philadelphia,	Pa.	Bullock & Crenshaw.
Weiss, Wm. Erhard,	Canton,	O.	Fisher & Young.
Weitzel, Sue C.,	Greensburg,	Pa.	Susan Hayhurst, M.D.
Wells, James Ralston, Jr.,	Philadelphia,	Pa.	Bullock & Crenshaw.
Wentzler, Hartman Gotthard,	Muncy,	Pa.	Chas. Ouram.
Weston, Edythe,	Wilmington,	Del.	M. Reynolds.
Wetzel, Samuel,	Carlisle,	Pa.	W. F. Horn.
Whiteley, Joseph C.,	Philadelphia,	Pa.	Fred. Rapp.
Wild, Geo. Fred.,	Logansport,	Ind.	D. E. Pryor.
Williamson, Thos. McGill,	Frederick,	Md.	J. A. Williamson.
Wilson, Oliver Fawcett,	Pittsburg,	Pa.	E. F. Kessler.
Winger, John Bowman,	Philadelphia,	Pa.	Wm. F. Hartzell.
Wissmann, Herman Bayard,	Philadelphia,	Pa.	H. T. Hayhurst.
Woltman, Enos Frederick,	York,	Pa.	B. S. Gilbert & Co.
Young, Ben Lee,	Huntsville,	Ala.	Wallace Procter.
Ziegler, John Clayton,	York,	Pa.	B. S. Gilbert.
Zullinger, Aaron Henry,	Chambersburg,	Pa.	Greenawalt Bros.

THE AMERICAN
JOURNAL OF PHARMACY

FEBRUARY, 1896.

A CONTRIBUTION TO THE KNOWLEDGE OF SOME NORTH AMERICAN CONIFERÆ.

BY EDSON S. BASTIN AND HENRY TRIMBLE.

(*Continued from page 39.*)

GENERAL CHARACTERS OF THE PINASTER GROUP.

The pines of this group differ from those of the Strobus group already studied, not only in the fact that their wood is darker, harder and more resinous, but in the structure of their cones and leaves. The scales of the cones are usually thicker and more woody, the apophysis, particularly, is considerably thickened and the umbo is dorsal instead of being terminal, and, instead of being unarmed, is usually armed with a spine, more or less strongly developed. The scaly sheaths at the base of the leaves are much more persistent, and the leaves are most commonly in twos or threes, though in a few species they are in fives, the same as in the white pines.

PINUS RIGIDA, MILLER.

PITCH PINE.

GENERAL CHARACTERS.

This tree is native to the eastern part of our continent, ranging in habitat from New Brunswick to the mountains of northern Georgia, and from the coast westward to eastern Kentucky and Ohio. It frequents rocky or thin, sandy soil, and under favorable conditions attains a height of 80 or 90 feet. Its outer bark is dark and rough, and its wood quite hard and resinous.

Its leaves are in threes, or more rarely in twos, from short sheaths, and are from 3 to 5 inches in length, dark green in color and rather

coarse and rigid. Its cones are from 1¼ to 3¼ inches long, ovate-conical, frequently in clusters of two or three, and the scales are tipped with a short recurved prickle.

MICROSCOPICAL STRUCTURE.

The leaves in cross-section showed two flat and one convex surface, the latter much wider than either of the others, so that the two flat surfaces formed a very obtuse angle with each other. The epidermis and endodermis were somewhat cutinized, and in mature leaves epidermis, hypoderma, pericycle, endodermis and xylem were all more or less lignified. Hypoderma composed of one or two layers of thick-walled fibres interrupted at frequent intervals on all

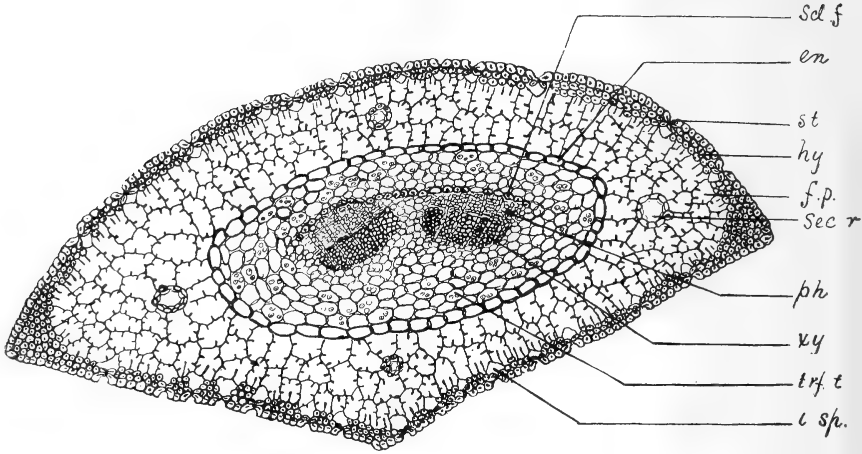


Fig. 8, cross-section of leaf of Pinus rigida, magnified 65 diameters. *Scl, f*, sclerenchyma fibre on the exterior border of the phloem; *en*, cell of the endodermis; *st*, stoma; *hy*, fibrous tissue of the hypoderma; *f, p*, folded parenchyma composing the mesophyll; *sec, r*, secretion reservoir; *ph*, phloem of one of the bundles; *xy*, xylem of one of the bundles; *trf, t*, transfusion tissue composed of short tracheids with bordered pits; *i, sp*, intercellular space over stoma.

sides by the stomata. Stomata in longitudinal rows, about twenty-two rows in all on each leaf. Mesophyll composed of rather large cells, and imbedded in it were about four secretion reservoirs, one opposite each of the three angles of the leaf, and one opposite the middle of the convex surface. About the reservoirs were a few thick-walled strengthening cells in a circle composed mostly of

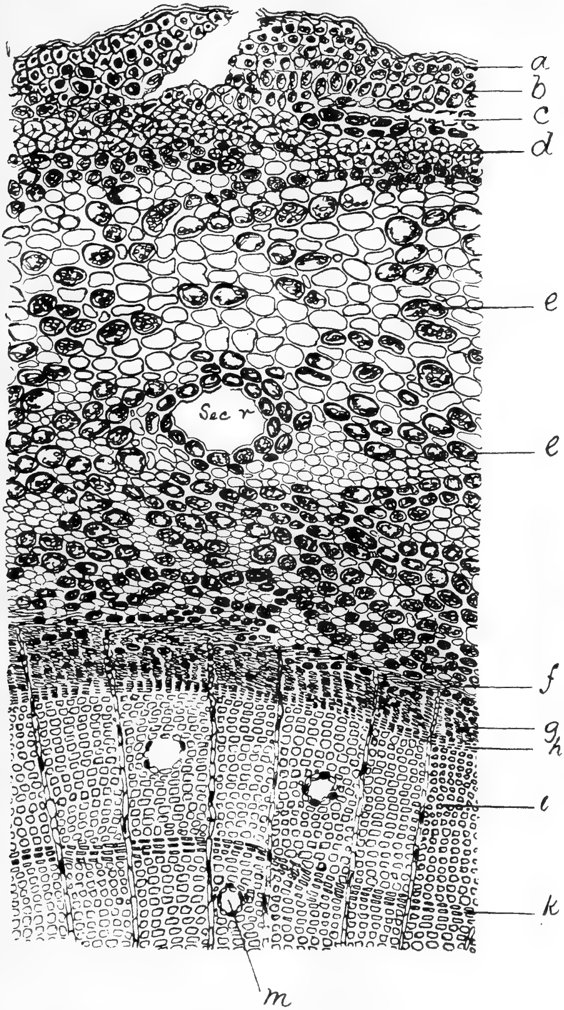


Fig. 9, part of cross-section of stem of P. rigida, magnified 75 diameters; *a*, cutinized and very thick-walled epidermis; *b*, hypodermal tissue; *c*, fissure; *d*, sclerotic or stony tissue; *e*, *e'*, tannin cells in middle bark; *f*, collapsed sieve tissue in older bast; *g*, newer sieve tissue; *h*, cambium zone; *i*, tracheids of xylem; *k*, ring of growth; *m*, secretion reservoir in the wood; *sec*, *r*, secretion reservoir in bark.

This drawing, as well as that of the stems of P. Austriaca and of P. palustris, was made from a specimen which had been treated with a solution of ferric chloride in absolute alcohol, and is intended to show the distribution of tannic matters.

much thinner-walled ones. The endodermis was rather large-celled; the pericycle was many-layered and composed of discigerous tracheids; interior to these were two open collateral bundles, each with about four one- or two-rowed medullary rays. A few thick-walled fibres occurred at the outer ends of the phloem masses, but they did not form a continuous layer. (See *Fig. 8.*) The oleoresin of the leaf seemed to be nearly confined to the secretion reservoirs and the secreting cells immediately surrounding them.

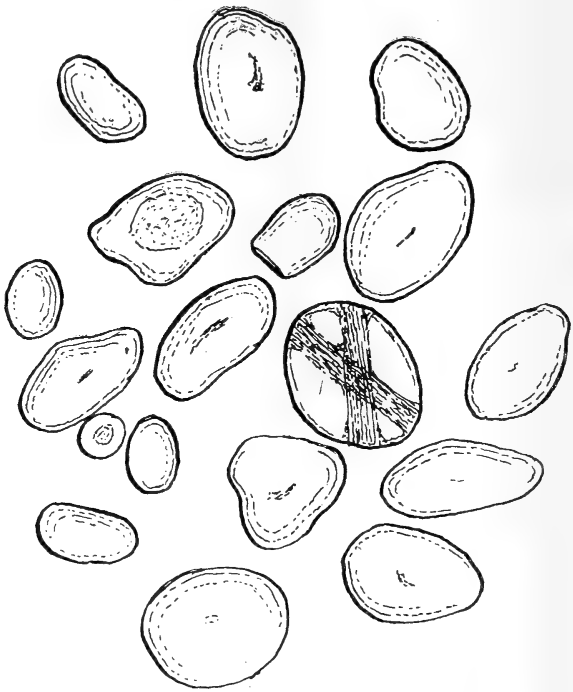


Fig. 10, starch from root of Pinus rigida, magnified 1,200 diameters. The granule marked with a cross shows the effect of polarized light. The grain has few and very faint markings, even the hilum being in many instances difficult to recognize except by the aid of polarized light.

Most of the mesophyll cells contained some tannin and a considerable proportion of them were very rich in it. It also occurred in the phloem tissues of the bundles, but only to a slight extent elsewhere in the leaf.

A cross-section of a twig two or three years old showed the following structure:

At the exterior the strongly cutinized and somewhat lignified epidermis may still persist, supported underneath by collenchyma. At a depth of several layers of cells underneath the epidermis, there was found a phellogen, which gave rise to layers of stone and cork cells. Interior to this was the ordinary cortical parenchyma, consisting mostly of rather large, thin-walled cells, which were tangentially elongated. This region contained secretion reservoirs, which appeared round or elliptical in cross-section, but were seen in longitudinal section to form long tubes. There were in this portion of the cortex few, if any, lignified elements. The older portion of the bast layer consisted for the most part of collapsed and ill-defined sieve elements. In the newer bast the walls of the individual sieve tubes were well defined, but the cells were of small diameter. Scattered among the sieve tubes were cells of larger diameter, mostly containing secretions, some oleoresin, others apparently mucilage. The wood had substantially the same structure as that already described in Pinus Strobus.

Oleoresinous matters abounded not only in the secretion reservoirs of the bark and wood and in the secretion cells about them, but in many scattered cells of the cortical and bast layers, in some of the medullary ray cells, and even in some of the tracheids of the xylem. Tannin was abundant in the bark, in all parts of it and in the cambium. It also occurred, though less abundantly, in the xylem, particularly in the secreting cells about the resin tubes and in the medullary rays. The distribution was, in fact, similar to that already described in Pinus Strobus, though the latter species appeared to contain considerably less of it. The drawing (*Fig. 9*) was made from a section which had been treated with a solution of ferric chloride in absolute alcohol. The color of the precipitate was greenish black.

CHEMICAL COMPOSITION.

The leaves of Pinus rigida were not examined chemically, because at present they possess no apparent economic value. As pointed out in the preceding description of the microscopical characters, the oleoresin is the most abundant constituent of the bark. Tannin was also found to be present in creditable amount, but mucilage was found in much smaller proportion than in P. Strobus. A sample of the stem bark, collected in November, yielded the following percentages of astringent principle:

	Per Cent.
Moisture	9·00
Ash in absolutely dry bark	1·03
Tannin in air-dry bark	14·63
Tannin in absolutely dry bark	16·07

The tannin was indicated to be of the oak bark variety by the following reactions:

Ferric chloride: green color and precipitate.
Bromine water: yellow precipitate.
Lime water: purplish precipitate.

The ash was composed of calcium phosphate, with some sulphate and carbonate.

ECONOMICS.

Pitch Pine is valued chiefly for its oleoresin, which, however, is in such abundance as to interfere with its usefulness as lumber. It was, in Colonial times, a source of turpentine in the Northern States; and in southern New Jersey, western Pennsylvania and parts of New England it has been used as a source of tar. The abundance of resin has made the wood valuable for fuel, and a very good quality of charcoal has been prepared from it.

PINUS AUSTRIACA, HÖSS.

AUSTRIAN PINE, BLACK PINE.

GENERAL CHARACTERS AND DISTRIBUTION.

The Austrian pine is regarded as a variety of the Corsican pine of Southern Europe, Pinus Laricio, Poiret. It is considerably cultivated in this country as an ornamental tree. It is a rough-boled, rough-branched, massive-topped tree, which does not attain any great height. Its buds are rather large, its leaves dark green, rigid, chiefly in twos, 4 to 6 inches long, mostly with one flattish and one strongly convex surface.

MICROSCOPICAL STRUCTURE.

The stomata were in longitudinal rows on both surfaces; hypoderma of two or three rows of fibrous, thick-walled cells; mesophyll cells of small or moderate size; usually about six secretion reservoirs, nearly equidistant from one another in the mesophyll, and each strengthened by a complete circle of thick-walled cells, the stele including two fibro-vascular bundles, each with about six medullary rays. There were observed a few scattered thick-walled fibres at the outer end of the phloem masses, and near the xylem ends of the bundles were frequently one or two small secretion reservoirs.

The structure, in other respects, was found to be similar to that of the leaf of P. rigida.

The cross-section of a twig of this species showed a structure not unlike that of P. rigida, except that the secretion reservoirs appeared to be rather more abundant, both in the bark and in the wood.

The distribution of oleoresinous matter was otherwise similar, and the distribution of tannin was also similar. (See *Fig. 12.*)

An examination of the roots of these two species did not reveal any decided differences between their structure and that of the

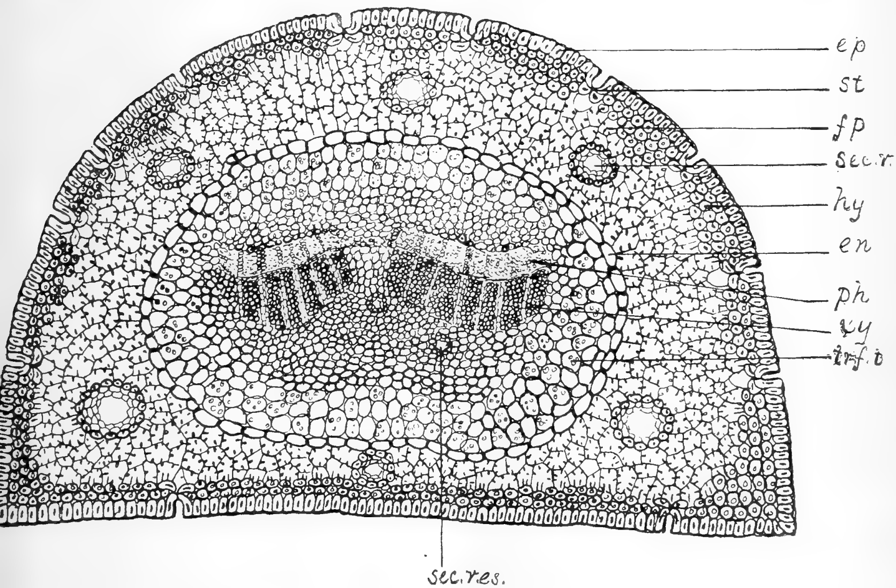


Fig. 11, cross-section of leaf of Pinus Austriaca, magnified 65 diameters; *ep*, epidermis; *st*, stoma; *f*, *p*, folded parenchyma composing the mesophyll; *sec*, *r*, secretion reservoir; *hy*, hypodermal fibres; *en*, endodermis; *ph*, phloem; *xy*, xylem; *trf*, *t*, transfusion tissue; *sec*, *res*, small secretion reservoir in the stele.

stems of the same species, except, of course, such differences as generally exist between root and stem structures. The wood of the roots, however, was larger-celled, and the cells thinner-walled, making the structure more spongy. The bark of both roots seemed to possess somewhat less tannin than that of the stems, and the parenchyma cells, both of the bark and medullary rays, were rich in starch, while the corresponding cells of the stem contained very

little, and that relatively very fine-grained. The wood of the roots appeared to be somewhat richer in tannic matters than that of the stems.

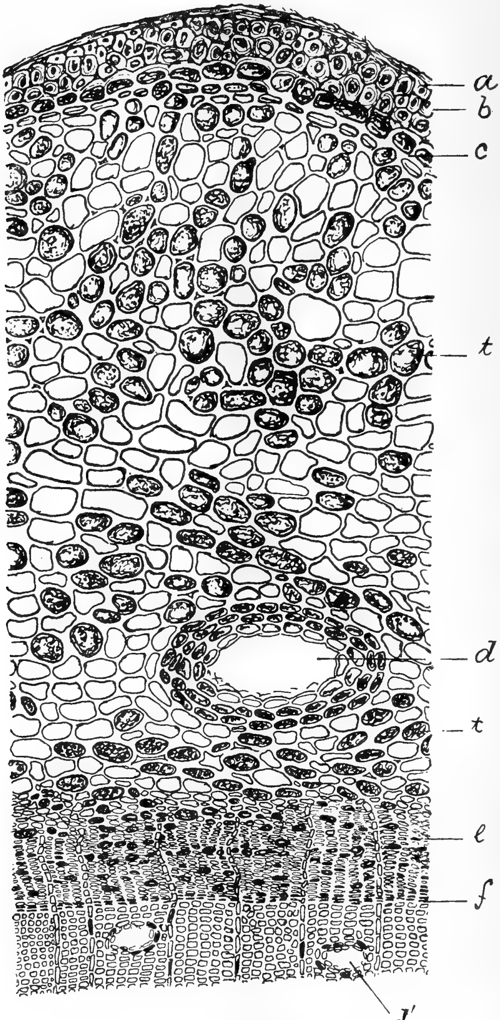


Fig. 12, part of cross-section of stem of Pinus Austriaca, magnified 75 diameters; *a*, epidermis; *b*, hypoderma; *c*, phellogen layer beginning to form; *d*, secretion reservoir in middle bark; *e*, bast layer; *f*, cambium zone; *d′*, secretion reservoir in wood; *t*, *t′*, tannin cells. All of the cells whose contents are strongly shaded contain tannin.

CHEMICAL COMPOSITION.

For the purposes of this investigation, a tree of Pinus Austriaca, about 6 feet in height, was taken from a nursery near Philadelphia, in November. As is well known, the oleoresin is an important constituent of this tree, but no investigation of that substance was made. Mucilage was found to be present in moderate proportion.

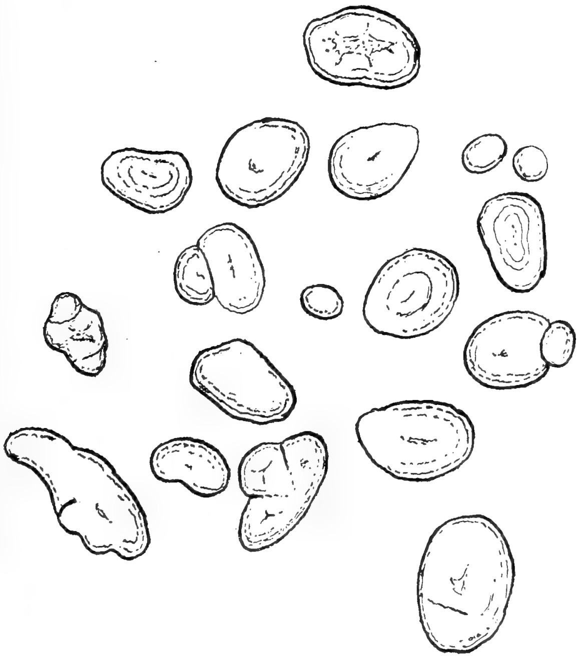


Fig. 13, starch from the root of P. Austriaca. The grains are smaller, more distinctly marked, and more commonly compound than in P. rigida.

The tannin, moisture and ash were estimated in the several parts of the tree, with the following percentage results:

	Moisture.	Ash in absolutely dry state.	Tannin in air-dry state.	Tannin in absolutely dry state.
Leaves	6·70	3·05	3·56	3·86
Trunk bark	7·25	2·17	13·58	14·64
Root bark	5·96	2·73	11·12	11·82

The tannin from all of the parts gave a green color and precipitate with ferric chloride, and a yellow precipitate with bromine water, thus indicating its probable identity with that from oak bark. The ash consisted of calcium phosphate, with some sulphate and carbonate.

ECONOMICS.

So far as this country is concerned, the Austrian pine is used only as an ornamental tree, for which purpose, however, it is in unusual favor. In its native locality, Austria and southern France, it, with the closely related Pinus Laricio, furnishes a considerable quantity of turpentine.

PINUS PALUSTRIS, MILLER.

LONG LEAVED PINE, SOUTHERN YELLOW PINE.

GENERAL CHARACTERS AND DISTRIBUTION.

The stem and leaves of this species have been studied microscopically, and the leaves and bark chemically. The long-leaved pine is one of the most valuable members of the genus. It is the chief source of the terebinthinous products of this country, and its wood contributes no small part to the lumber industry.

According to the "Report of the Chief of the Division of Forestry" for 1891, this pine is distributed through all the South Atlantic and Gulf States, at some distance from the coast, and covering a belt about 125 miles in width, interrupted only by the alluvial plains of the Mississippi and Red Rivers, in Louisiana and Texas. In addition, there is found in western Georgia and Alabama an extension in islands or patches, northward to latitude 34·5°. In Virginia this species has become almost extinct, being replaced by the loblolly pine.

In North Carolina the forests exclusively of long-leafed pine begin south of Bogue Inlet, with a width of 95 to 125 miles inland, and extending southward to the State line, covering about 6,500,000 acres; this is largely tapped for turpentine.

In South Carolina the pine belt is 150 miles wide, much of which is still untouched. In Georgia the flat woods of the shore have mostly been stripped of this pine, but the vast interior plane of 17,000 square miles is almost exclusively covered with it. In Florida it may be traced on the Atlantic Coast as far north as St. Augustine. In western Florida, large areas are pretty well ex-

hausted. The Gulf Coast pine belt, covering some 40,000 square miles, shows no difference from the Atlantic forest.

The upper division of the pine belt, a region of mixed growth in Alabama on a broken surface, covers about 23,000 square miles, while the belt of drift deposit which crosses the State contains about 1,000 square miles, covered with long-leaf pine of excellent quality and large yield per acre. The drift deposits along the Coosa River, covering about 300,000 acres, and a detached portion of 60,000 acres, are covered with pine of fine quality, hardly yet touched.

In Louisiana, on the eastern side of the Red River, there is a somewhat isolated area of long-leafed pine, estimated at 1,625,000 acres, and in Texas a similar area of 5,000 square miles; in neither State has this vast supply been tapped for turpentine to an appreciable extent.

The long-leafed pine tree is tall, straight-boled, has a thin-scaled bark, and a very hard, resinous wood. The stem separates near the summit into several diverging branches, giving the tree a flattish top. The leaves are in threes, or rarely in fours, from 10 to 15 inches long and subtended at the base by a conspicuous scaly sheath, from 1 inch to 1½ inches long. The leaves are crowded at the ends of the branches. The cones are terminal, from 6 to 10 inches long, conical or oblong-conical, the scales thick and armed with a short recurved spine.

MICROSCOPICAL STRUCTURE.

The leaves in cross-section showed the following structure: Triangular, with two flattish sides and one broader, convex one. The epidermis on all sides was perforated by stomata, which are arranged in nearly equidistant longitudinal rows on the different sides. There were observed from sixteen to twenty rows in all. The hypoderma consisted of from two to four layers of thick-walled fibrous cells, interrupted where the stomata occurred. The mesophyll cells were of medium size, and with the walls folded as in other species of Pinus. The secretion reservoirs were usually about four, arranged as in the leaf of P. rigida, except that they occurred close to the endodermis. The endodermis was large-celled, enclosing a pitted pericycle tissue of many layers, within which laid two collateral fibro-vascular bundles. At the outer end of each phloem mass was a double row of thick-walled fibrous cells. At the outer end of each xylem mass was a loosely arranged parenchyma, usually with large intercellular

spaces, and still further outward, next the pitted pericycle tissue, was an arc of thick-walled fibres in one or two rows.

The distribution of tannin in the leaf was found to be similar to that already described in the leaf of P. rigida.

A cross-section of a stem of one year's growth showed the following structure: At the exterior a thick-walled, small-celled epidermis, supported by a much larger-celled hypoderma, whose cells were somewhat lignified, but much thinner-walled. This was succeeded internally by a few layers of stony tissue, abutting on a layer

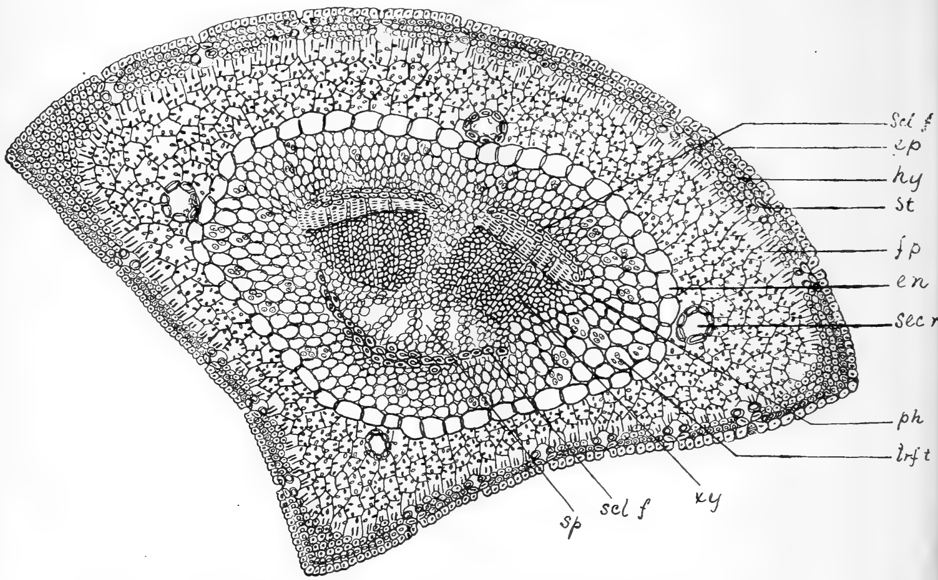


Fig. 14, cross-section of leaf of Pinus palustris, magnified 65 diameters. *Scl*, *f*, sclerenchyma fibres bounding the bast on the outside; *ep.*, epidermis; *hy*, hypodermal fibers; *st*, stoma; *f p*, folded parenchyma composing mesophyll; *en*, endodermis; *sec*, *r*, secretion reservoir; *ph*, phloem of one of the bundles; *trf*, *t*, pitted pericycle or transfusion tissue; *xy*, xylem of a bundle; *scl*, *f*, sclerenchyma fibers protective to the xylem; *sp*, intercellular space.

of phellogen. Interior to the phellogen succeeded a considerable thickness of large-celled parenchyma, through which were scattered stone cells, either singly or in clusters of from two to eight or more. Here also occurred secretion reservoirs, which, in structure and distribution, did not differ materially from those of the other species described. Now and then, also, a crystal cell containing crystals of calcium oxalate, similar in appearance to those already described in

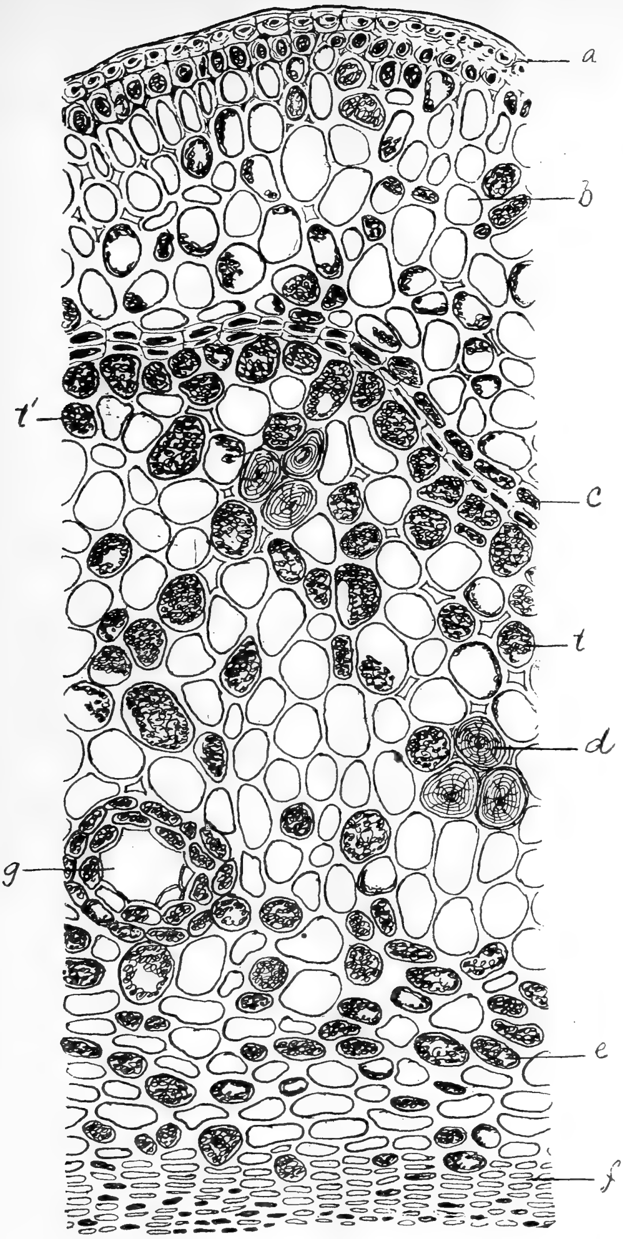


Fig. 15, portion of cross-section of stem of Pinus palustris, extending from epidermis nearly to the cambium zone, magnified 75 diameters. *a*, thick-walled epidermis; *b*, hypodermal tissues; *c*, area of thick-walled cells formed from a phellogen layer; *t*, tannin cell; *d*, stone cell in cortex; *e*, tannin cell; *f*, bast tissue.

P. Strobus, was observed. The bast, cambium and xylem layers were observed to be similar in structure to those already described in the other species. The principal structural difference between this stem and the stems of the other species was the larger average

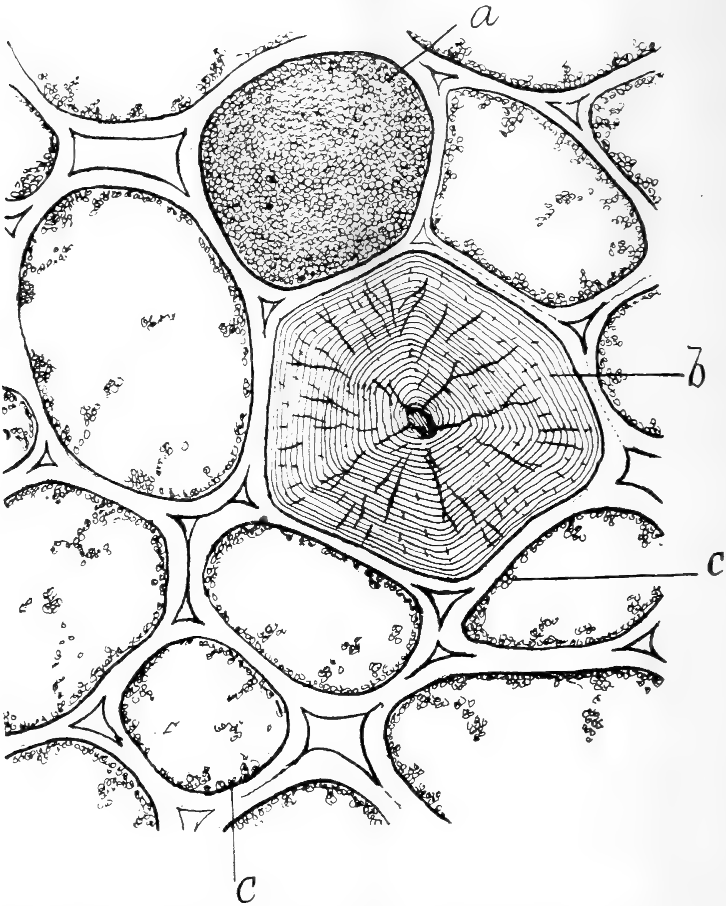


Fig. 16, small portion of cortex of P. palustris, magnified 300 diameters. *a*, tannin cell, containing tannin in great quantity; *b*, stone cell; *c*, *c'*, ordinary parenchyma cells, containing a little tannin.

size of the bark cells and the presence of scattered stone cells in the middle layer. The cells were also obviously much richer in oleoresin. The alkannin test showed its presence in nearly all the tissues.

The bark and wood showed also a distribution of tannin similar to that described in the other species, and the precipitate which it produced with ferric chloride solution was greenish black. It should be observed that in this species, in P. rigida and in P. Austriaca, the tannic precipitate had in a few of the cells a bluish black appearance under the microscope, probably owing to the presence in these cells of other bodies related to tannin, which were precipitated by the same reagent.

A COMPARISON OF THE MORE RECENT METHODS FOR THE ASSAY OF CINCHONA BARK.

BY LYMAN F. KEBLER.

No less an authority than Dr. Fr. Hoffmann, in a review of a recent text-book of pharmacy, commented on its omissions as follows: "Among the latter (omissions) may be mentioned the desirable introduction of a chapter on the valuation or estimation of alkaloidal galenical preparations, a subject of constantly increasing importance in manufacturing and dispensing pharmacy. Although still in a state of evolution and imperfection, several methods of considerable value for the identification and estimation of drugs, as well as their fluid extracts and tinctures, have been established during recent years. The importance of the application of pharmaceutical research in this direction, and the valuation of the therapeutical constants of important plant remedies, is now of such a recognized prominence that it is one of the foremost problems in pharmacy."

In selecting a method for assaying cinchona bark, due consideration must be given to the kind of information desired. While the pharmacist does not require as elaborate a method for standardizing his preparations as the manufacturer of quinine in selecting his barks, yet he ought to be in possession of a process that yields no less accurate and satisfactory results in a comparatively short time.

The methods considered most efficient and practicable for extracting the alkaloids both from the bark and its galenical preparations may be classed as follows:

(1) The powdered bark or its preparations are macerated with ether and ammonia water, or a mixture of chloroform, ether and

ammonia water, and an aliquot part taken for analysis. Schweissinger-Sarnow,[1] Keller[2] and the author.[3]

(2) The powdered bark or its preparations are macerated with a mixture of chloroform or ether, or a mixture of both in conjunction with alcohol and ammonia water, and an aliquot part taken for analysis. Prollius,[4] De Vrij,[5] Lyons,[6] Haubensak,[7] Kürsteiner[8] and U. S. P., 1890.

The table below is given to show at a glance how closely some of the extractive solvents of the various methods approximate one another:

TABULAR VIEW OF THE AGENTS EMPLOYED IN EXTRACTING THE ALKALOIDS, ETC.

PROCESS.	Cinchona Bark.	Alcohol.	Chloroform	Ether.	NH_4OH 10 Per cent.	Amount of Menstr. Taken per Assay.	Color of Alkaloids.
U. S. P., 1890 . . .	20 gms.	152 c.c.	40 c.c.	—	8 c.c.	100 c.c.	Chocolate.
Prollius	20 gms.	20 gms.	—	170 gms.	10 c.c.	120 gms.	Chocolate.
Lyons Nos. 1 and 2[1]	20 gms.	13·8 c.c.	—	180 7 c.c.	5·5[5] c.c.	100 c.c.	No. 1 chocolate. No. 2 nearly white.
Lyons Nos. 1 and 2[2]	20 gms.	13·7 c.c.	43·9 c.c.	137 c.c.	5·4[5] c.c.	100 c.c.	No. 1 chocolate. No. 2 nearly white.
Haubensak	20 gms.	20 c.c.	—	170 c.c.	10 c.c.	100 c.c.	Nearly white.
Haubensak and Kürsteiner[3] . .	20 gms.	30 gms.	—	170 gms.	15 c.c.	100 gms.	Nearly white.
Haubensak and Keller	12 gms.	—	—	120 gms.	10 c.c.	100 gms.	Yellowish white.
Chloroform-Ether[4]	20 gms.	—	50 gms.	150 gms.	20 c.c.	100 gms.	Whiter than any other process.

[1] Prollius' mixture.

[2] Prollius' fluid modified.

[3] Moistens the drug first with 5 grammes of 12·19 per cent. hydrochloric acid.

[4] The method as used by the writer for several years and applied to the various drugs and their preparations. Mr. Keller has recently published a process for assaying cinchona bark, that approximates this one very closely. Schweiz. Wochenschr. f. Chem. u Pharm., through the Pharm. Era (1896), **15**, 78.

[5] Strong ammonia water.

[1] 1890, Pharm. Centralhalle, **31**, 771.

[2] 1892, Schweiz. Wochenschr. f. Chem. u. Pharm., **30**, 501, 509; AM. J. PHARM., **65**, 78. 1893, Ztschr. Oesterreich. Apotheker, **47**, 563, 586; AM. J. PHARM., **66**, 42.

[3] 1895, AM. J. PHARM., **67**, 499; J. Am. Chem. Soc., **17**, 822.

[4] 1881, Arch. d. Pharm, **209**, 85, 572; AM. J. PHARM., **54**, 59.

[5] 1882, Neder. Tijdschr. de Pharm., January; AM. J. Pharm., **54**, 290.

[6] 1884, Druggists' Circular, **28**, 114; Pharmaceutical Assay, § 13, 14, 29–36, 127, 128.

[7] 1891, Schweiz. Wochenschr. f. Pharm., **29**, 147; AM. J. PHARM., **63**, 347.

[8] 1892, Schweiz. Wochenschr. f. Chem. u. Pharm., **30**, 473; Pharm. Ztg., **37**, 750; AM. J. PHARM., **65**, 71.

The time required for the execution of the several processes varied from six to twenty-four hours, unless stubborn emulsions were encountered, as is not infrequently the case with several of the above processes.

The introduction of Prollius' method marks a new era in drug assaying. This method contains the germ from which have sprung nearly all of the most valuable methods of recent date. Prollius proposed to employ an ethereal solvent for estimating the ether-soluble alkaloids, and a chloroformic mixture for extracting the total cinchona alkaloids. It was originally designed for determining the alkaloidal value of cinchona bark, but the various modifications proposed now make it possible to apply the process to a large number of narcotic drugs and their preparations. At first, it was deemed essential to macerate the drug twenty-four hours, but experiments have proven that four hours, with a fine powder, is ample time. In this work, maceration for all methods, with the bark, was continued about four hours, with repeated agitation.

The fluid extracts were prepared as follows: Fluid extract No. I: 100 grammes of the drug were macerated three days with a menstruum composed of alcohol two parts, glycerin and water each one part; the percolation was then allowed to proceed, gradually adding of the above mixture, until 150 c.c. of the percolate were obtained. Fluid extract No. II was prepared in the same way as the above, except that the U. S. P. menstruum was employed. Fluid extract cinchona calisaya was prepared on a large scale. The fluid extracts were prepared from the respective barks assayed below.

With the processes involving the extraction of the alkaloids by means of immiscible solvents, the fluid extracts were diluted with an equal weight of water, then treated directly with the solvents for one hour, with frequent agitation, and an aliquot part taken for analysis. Fluid extracts Nos. I and II were only two-thirds normal strength, but the percent. of the alkaloids is based on a normal extract. Under these conditions the following results were obtained:

The results on the following page indicate that the methods which evaporate an aliquot part of the extractive solvent, then extract the partly dried residue with dilute sulphuric acid, and subsequently shake out the alkaloids, do not yield the full amount of the active constitu-

ents. This is, undoubtedly, due to the presence of the gummy extractive matter, which, when treated as above, agglutinates into small particles that envelope the alkaloids. These small particles being insoluble in the menstruum employed, makes it impossible to recover the alkaloids so occluded. In connection with the sulphuric acid, Dr. A. B. Lyons employs ether, which appears to facilitate the extraction somewhat.

Process.	Percent. of alkaloids in Cinchona Calisaya.				Percent. of alkaloids in Fluid Extract Cinchona Calisaya.		
	1	2	3	Average.	1	2	Average.
U. S. P., 1890	8·20	7·99	8·20	8·13	5·80	6·00	5·90
Chloroform-ether	9·57	9·31	9·40	9·42	6·41	6·39	6·40

Process.	Percent. of alkaloids in Cinchona Rubra.	Percent. of alkaloids in Fluid Extract Cinchona Rubra, No. I.	Percent. of alkaloids in Fluid Extract Cinchona Rubra, No. II.
U. S. P., 1890	4·57	2·43	—
Prollius	4·56	2·57	—
Lyons, No. 1[1]	4·79	2·49	—
Lyons, No. 2[1]	5·73	2·39	3·89
Lyons, No. 1[2]	4·97	—	—
Lyons, No. 2[2]	5·81	3·51	3·93
Haubensak	5·96	3·43	3·97
Haubensak and Kürsteiner	5·90	3·59	—
Haubensak and Keller	5·27	3·61	—
Chloroform - ether	5·77	3·50	4·07

[1] Prollius' mixture. [2] Prollius' fluid, modified.

The writer has frequently treated the gummy residue with an undue amount of water, but the filtrate, when tested for alkaloids, always responded affirmatively. In view of this fact, the following experiment was made: the gummy residue was washed with water until the filtrate was only slightly acid to litmus paper; this required about 180 c.c. The filtrate was now collected in a graduated cylinder. After the first 100 c.c. were obtained, the issuing filtrate was tested by both Wagner's and Mayer's reagents; both gave

heavy precipitates. The residue was now treated with a few drops of dilute sulphuric acid, the particles disintegrated, with a stirring rod, as much as possible, and washed with water until a second 100 c.c. were obtained. The filtrate was again tested as above with the same results. The above operation was continued until 500 c.c. were obtained, testing the filtrate at intervals of 100 c.c. After 500 c.c. had passed, the filtrate still gave a turbidity with both of the above reagents. These results demonstrated to the writer that it was practically impossible to obtain all of the alkaloids by the methods embodying the above procedure.

Another difficulty inherent in these methods is the proneness of the immiscible solvents to emulsify, and the slowness of separation. This is, undoubtedly, due to the mechanical action of the particles thrown out of solution on rendering the latter alkaline. It was necessary to discard several assays in this work on account of this objectionable feature.

According to the U. S. P. process, we are to obtain 150 c.c. of the extracting menstruum, after treating the bark; but the writer's experience has been that only about 140 c.c. are obtained. The other 10 c.c. are only obtainable by applying pressure to the bark on the funnel, which is objectionable, if not detrimental.

The method of Prollius yields impure alkaloids and possesses several undesirable features.

The methods that have proven quite satisfactory are those in which the immiscible extractive solvents are directly shaken out with acidulated water. Kürsteiner's modification of Haubensak's method does not appear to possess any advantage over the original process. Keller's modification of the same process must be considered of secondary importance, although very good, from the fact that Mr. Keller has published a second and better method for the same drug. After eliminating the above processes, we have left three methods that leave very little to be desired, viz.: Lyons' general process No. 2 with Prollius' mixture, Haubensak's, and the chloroform-ether processes. With the bark these methods varied from one another only 0·2 per cent., while with the fluid extracts there was even less variation. The color of the alkaloids of these methods is also very good. Those obtained by Lyons' and Haubensak's methods possess a slight chocolate color, while those obtained by the chloroform-ether process are more nearly white.

In conclusion, it is only necessary to say that, while the author favors the chloroform-ether process, he cannot consider it superior to the methods of Lyons and Haubensak to any extent.

PHILADELPHIA, January 20, 1896.

THE INFLUENCE OF CERTAIN MEDICINAL COMPOUNDS ON THE CHARACTER OF THE URINE.

BY FREDERICK W. HAUSSMANN.

The examination of urine for abnormal ingredients, in particular albumin and sugar, involves frequently questions of considerable delicacy.

To the analyst, examining insurance cases, and to the practical physician, the presence of traces of these compounds is an important matter, and it is, at times, difficult to express a decided opinion upon the normal or abnormal condition of the secretion.

Normal urine possesses the property of responding feebly to a number of reactions for glucose, and the percentage of the reducing principles, estimated by the various methods as given by different authorities, is found subject to variations. The fact that Fehling's solution is reduced and other reactions for glucose respond to a greater or less degree, by urine passed after the administration of a number of internal remedies, has only received attention in recent years, and while much remains to be learned on the subject of their elimination, in many instances we are able to foretell the occurrence of such reactions.

In the composition of such urines, we notice, however, peculiar variations.

A number will respond to every commonly employed reaction for glucose, some only to certain tests, while with the others entirely negative results will be obtained.

For instance, in urine passed after the administration of chloral hydrate, we have both the Moore-Heller reaction for glucose with alkaline hydrates, also the reducing action upon Fehling's solution, while to Boettger's bismuth test the urine will not respond.

Similar results are found in a number of instances.

The reducing power of such urines also varies considerably, some possessing this property feebly, while others reduce alkaline cupric tartrate solution readily, so that a suspicion of diabetes can be entertained, unless further inquiry is made.

To understand the reason for this action, so closely allied to glucose, it is necessary to briefly dwell upon the metamorphosis of such compounds in the human organism as far as known.

If we examine many of the remedies, after the administration of which the mentioned properties of the urine are found, it is found, in most instances, that their action upon glucose reagents is entirely negative.

Careful research has revealed the fact that compounds are formed with glycuronic acid, a substance which has many properties in common with dextrose or ordinary grape sugar. These compounds possess a number of peculiar properties, both in chemical behavior and their action upon polarized light.

In our subject, their action upon glucose reagents is of primary importance.

In normal urine, a glycuronic compound is stated to exist, the indoxyl glycuronic acid, to which some of the reducing action of the secretion is due.

Again, in the examination of glycuronic urine in general, it must be remembered, that other urine constituents also possess a similar action.

Such are uric acid, creatinin and probably other compounds, of which we possess a limited knowledge.

The reduction of these compounds takes place at a higher temperature, in some only after prolonged boiling, which property may form a point of distinction from diabetic urine.

In the following statement the writer will chiefly dwell upon such urine, which came under personal observation, adding a few data collected from different works on urine analysis.

Chloral Urine.—The peculiar action of this secretion upon glucose reagents has already been mentioned.

Chloral hydrate is rarely found as such in urine, at best only in traces, and is eliminated as urochloralic acid.

This compound turns polarized light to the left, a common property of glycuroine compounds, reduces Fehling's solution, has the same action upon indigo-sulphuric acid as glucose, but does not respond to Boettger's bismuth test. In the writer's experience the amount of chloral ingested influences the reducing power of the urine upon Fehling's solution.

Material increase of the specific gravity of the secretion does not

seem to take place, which forms a distinguishing feature from diabetic urine.

In the pale urine of a delirium tremens case, to which chloral was administered in large doses, the amount of Fehling's solution reduced by the eliminated urine corresponded to 0·4 per cent. of glucose.

In the light-colored specimen, with the specific gravity of 1·022, of a patient who had taken 60 grains of the drug, administered within two days, the amount of reduction corresponded to about 0·15 per cent.

This case was kept under observation, the urine being examined before and after the ingestion of chloral.

The reduction took place only during the administration of the drug.

A singular fact is that in chloral urine the Braun-Johnson picric acid and potash test do not react. This, together with the non-action of the bismuth test, is remarkable.

Croton Chloral Urine.—Regarding butyl chloral urine, conflicting statements are found.

According to some writers, it will reduce Fehling's solution, while according to Neubauer and Vogel, butylchloralic acid, under which form the drug is eliminated, possesses no reducing action upon cupric or other metallic oxides in alkaline solutions.

In one sample examined by the writer, the reducing action found was slight, by no means as prominent as in the case of chloral urine.

Chloroform Urine.—In connection with chloral urine, it may incidentally be mentioned that urine containing chloroform will also reduce Fehling's solution.

The distillate from a specimen of this kind reduces ammoniacal silver nitrate solution, while in the distillate from urine containing acetone, no such action takes place with either reagent.

Turpentine Urine.—The urine voided after the administration of oil of turpentine has repeatedly been the subject of investigation. The peculiar odor communicated to the secretion by this drug has been described as resembling that of violets, although the original terebinthinate odor is frequently noticeable, especially upon the addition of mineral acids.

In examining turpentine urine for abnormal ingredients, a knowledge of the physiological action of the oil is important.

Albumin Reactions.—Turpentine urine is not infrequently found to respond readily to albumin tests.

This may be due to a temporary albuminuria produced by the drug, the latter possessing the property of causing strangury and occasionally bloody urine.

In such cases the presence of albumin is transient, disappearing with the suspension of the drug.

Again, so-called resin acids make their appearance in the urine after the ingestion of turpentine, also manifesting themselves upon the application of certain tests for albumin.

The amount of albumin found in such urine varies apparently with the amount of the medicine administered; but it is in some instances surprising what little turpentine will produce a temporary albuminuria. Other factors, which are liable to cause nephritic disturbances, independent of the action of the oil, must, however, also be considered, such as febrile albuminuria or incipient Bright's disease.

A special examination was made in a case where opportunity was offered to study the effect of the drug upon the urinary secretion.

The urine of the patient, before the administration of turpentine oil, had a normal specific gravity, and bore no evidence of either albumin or sugar.

Six drams of the oil were administered in forty-eight hours, at the end of which a specimen of the urine was examined. The same had an acid reaction, the characteristic odor, a brown-red color, and a specific gravity of 1·032.

The examination for albumin gave the following result: Albumin was found by the heat test, nitric acid and picric acid contact methods, acetic acid and potassium ferrocyanide reaction, Tanret's test, and with concentrated magnesium sulphate in the presence of acids (Roberts' test).

Three days after stopping the medicine, the urine was again examined, the physical properties being nearly the same, the specific gravity, however, only 1·025. Traces of albumin were still found, but the reactions were more feeble.

Similar results were also obtained in the examination of other specimens of turpentine urine.

The resin acids mentioned may coexist with the albuminuria, and, upon the application of reagents, may also be precipitated.

Their difference from albumin is shown by their solubility in alcohol.

Physical Properties.—The color of turpentine urine is usually deep red, independent of the fact that blood may be present. The color continues some time after ceasing the administration of the oil.

The specific gravity, in the writer's experience, is increased, the increase continuing for some time. The reaction is, in most cases, strongly acid.

Sugar Reactions.—Turpentine urine will also respond to the commonly employed reactions for grape sugar.

This is due to terpenglycuronic acid, which has the property of reducing Fehling's solution.

The high specific gravity of such a urine specimen may have the tendency to suspect a diabetic condition, although the red color of turpentine urine differs from the one of diabetes.

The amount of oil of turpentine ingested apparently influences the reducing power of the urine.

For instance, in the specimen mentioned above, the amount of Fehling's solution reduced corresponded to a glucose percentage of 0·5, while in a case where 240 minims of oil of turpentine were administered in two to three days, the amount corresponded to 0·25 per cent. of glucose.

In the former specimen, after the medicine was stopped for 4 days, the amount of reduction corresponded to a glucose percentage only of ·1 per cent.

Marked diminution in the specific gravity also took place in this instance.

Other Glucose Tests.—Besides reducing Fehling's solution and responding to Trommer's test, turpentine urine will also give decided glucose reactions with Boettger's and Nylander's bismuth tests and the Braun-Johnson's picric acid and caustic alkali method.

The bismuth tests respond with the same rapidity as a grape sugar solution, while the deep mahogany color of the picramine test of Braun was readily developed on boiling.

It may be stated that the two tests mentioned last cannot be relied upon in most glycuronic urines. Examination of the different specimens of turpentine urine, after removing the reducing glycuronic compound by means of basic lead acetate, showed the same to be perfectly free from glucose.

Incidentally, it may be mentioned that pure oil of turpentine, examined with various glucose reagents, showed no reducing power whatever.

Other Remedies.—In connection with the foregoing, it may be stated that a number of other remedies produce similar reactions when eliminated by the kidneys.

Copaiba and its oil behave similarly to oil of turpentine when being examined for albumin.

When examined for the latter, the urine may reveal the presence of resin acids, and the same means, their solubility in alcohol, will furnish the point of distinction.

Incidentally, it may be mentioned that, after the administration of a large dose of cubeb and its preparations, an identical result is said to take place.

It may likewise be surmised that many remedies of a balsamic nature are liable to produce this effect.

Copaiba urine will also reduce Fehling's solution, but, according to Quincke, will not affect the bismuth tests. It is readily distinguished by its characteristic odor and the red or purplish color it develops when mixed with hydrochloric or other concentrated acids.

The numerous synthetical organic compounds, introduced into medicine within the last few years, furnish a large field for research in urine analysis.

The elimination of a number in the urine as glycuronic compounds has been studied, but many require further investigation.

They possess the peculiarities referred to in their action upon polarized light, being all lævogyre, as well as the reducing action upon glucose reagents.

Some, however, do not reduce the mentioned test liquids. Such are phenolglycuronic and camphoglycuronic acid, eliminated after the administration of carbolic acid and camphor, and the compounds formed after the ingestion of antipyrine and other remedies.

Among a number which exert a reducing action, a few deserve prominent mention.

Such are acetanilid or antifebrin, kairin, morphine, nitrobenzol and bitter almond oil, benzoic and salicylic acids, and their respective salts, together with others of more or less importance.

Acetanilid Urine.—This deserves, perhaps, more than passing notice. Urine passed after the administration of this compound readily reduces Fehling's solution and responds to most other sugar tests.

It is usually of a red color and increased specific gravity.

To physicians such urine is of considerable interest, also to the insurance analyst, if it is considered to what extent the drug is consumed in the form of the many popular headache and neuralgia remedies.

The popular effervescent headache cures, to the baneful influence of which many are addicted, will furnish us with this source of error, as well as the nostrums, principally composed of acetanilid, which enjoy the patronage of many physicians.

Acetanilid is eliminated in the urine as para amido phenol glycuronic acid.

According to Le Nobel, Nylander's bismuth test, to which acetanilid urine responds, reacts in a similar manner to glucose also with urine passed after the administration of kairin, tincture of eucalyptus and large doses of quinine, giving a black precipitate.

Chrysophanic Acid Urine.—Another urine, which cannot be strictly classed with the glycuronic, although it possesses a number of their properties, is chrysophanic acid urine, eliminated after the administration of rhubarb and senna.

This has been considerably treated upon recently, and a number of methods have been proposed to detect this principle in urine.

The statement has been made, by some writers, that such urine possesses the property of reducing alkaline copper tartrate and alkaline bismuth solutions.

Physical Properties.—Chrysophanic urine is of a yellow, sometimes greenish-yellow color, gradually turning darker as the urine undergoes decomposition.

It is characterized by the red color developed with alkalies, although the urine eliminated after the administration of santonin is said to possess the same property. The red color thus produced is again changed to yellow by the subsequent addition of acids.

Outside of its similarity in color, chrysophanic urine possesses none of the characters of urine containing bile, or, perhaps, only when the precipitation method by means of alkaline earth bases is employed, when, however, other distinguishing features prevail.

Comparison with Glucose Tests.—It is questionable whether the so-called reduction of copper tartrate or alkaline bismuth solution, by means of chrysophanic acid urine, is due to the inherent property of this principle.

Such urine, no doubt, has the property of slightly reducing Fehling's solution, but the reduction is probably due to other urine constituents, perhaps glycuronic compounds.

Even chrysophanic acid, extracted from rhubarb, has a feeble reducing power upon alkaline cupric tartrate solution.

To determine this point, the writer prepared chrysophanic acid from rhubarb, subjected it to the commonly employed sugar reagents, and compared with the substance commercially known as chrysophanic acid, the chrysarobinum of the Pharmacopœia.

The following differences were noticed:

The acid prepared from rhubarb in a saturated aqueous solution gave, with alkalies, a purple color, while a similarly treated chrysarobin solution became deep red.

The reducing action of the former upon Fehling's solution was extremely slight, while with the latter, precipitation of red cuprous oxide took place.

In the rhubarb acid, the blue of the copper solution was turned purple, with chrysarobin a red color.

Several other differing points were also observed.

In the examination of chrysophanic urine, in view of the action of alkalies upon this principle, the important fact must be considered that, with few exceptions, all tests employed for the detection of glucose take place in alkaline media.

It is therefore likely that the action of alkalies upon chrysophanic acid, namely the red coloration, may take place in such urine.

As many glucose tests are based on similar color reactions, this may prove a source of error in examining for small quantities of glucose.

The writer subjected various samples of chrysophanic urine, both natural and artificially prepared, to a number of sugar tests to study their effect.

(1) Moore-Heller test (heating with alkaline hydrate solutions).—Purplish red color, differing from the brown produced in the presence of grape sugar.

(2) Rubner's or O. Schmidt's test.—This consists in treating the urine with lead acetate solution, filtering and treating the filtrate with ammonia.

A white precipitate of lead saccharate is formed, which, if glucose is present, will assume a flesh or red color on boiling.

Thus employed, this test will not be affected by chrysophanic acid urine, as the lead salt will precipitate the latter. But if the following modification is employed, a different result may take place:

Three grammes of lead acetate are dissolved in 10 c.c. of urine, by heat, filtered and the still hot filtrate treated with ammonia.

On heating the mixture to boiling, the above-mentioned color will be developed in the presence of glucose.

In following this method with chrysophanic acid urine, part of the acid does not seem to be completely precipitated and to pass into solution, when, upon the addition of ammonia, also a red color will be produced, as in the case of glucose.

Some care is, therefore, necessary in employing this test.

(3) Reaction with copper solutions.—The usual method for the examination of urine for sugar consists in observing the action upon boiling diluted Fehling's solution.

If chrysophanic acid urine is added in this manner, the blue of the alkaline copper solution is turned to a reddish-brown, occasionally a purple color.

The usual reaction is the following:

Upon first addition of the urine, the blue color is changed to purple, gradually turning reddish-brown upon the further addition of the urine.

The amount of the principle present influences the reaction to a considerable degree, however.

(4) The bismuth tests.—Boettger's and Nylander's alkaline bismuth tests, when applied to chrysophanic urine, respond in a manner somewhat similar to glucose.

On boiling such urine with the alkaline bismuth mixture of Boettger, it assumes a purple color, while the precipitated bismuth salt will be blackish-gray.

A similar result takes place, according to Salkowski, in Nylander's modification, a blue-black precipitate being formed.

(5) Sachse's solution is used for the quantitative estimation of glucose.

It consists of solution of potassium iodohydrargyrate, with a considerable excess of alkali.

The solution is reduced to metallic mercury in the presence of glucose.

For a reliable sugar test in urine it is not adapted, as this secretion is liable to reduce it when glucose is absent. In chrysophanic urines this result takes place readily, the supernatant urine, after the precipitation of mercury, possessing a red-brown color.

It resembles, in this respect, diabetic urine; due to the large excess of alkali in Sachse's solution, the sugar is sometimes caramelized, and the mixture will have a brown color.

The same results may be expected in Knapp's alkaline mercuric cyanide solution.

(6) The picric acid and potash method of Braun and Johnson is also liable to produce a dark color, as with glucose, when applied to chrysophanic urine, due to the action of the alkali upon the acid.

In this test, however, no dark red color is produced, unless the other reducing constituents of urine are factors also. The yellow picric acid evidently retards the formation of the deep mahogany color produced in the case of glucose. But if the urine be rich in chrysophanic acid, the alkaline mixture will also turn quite dark on boiling.

Several other tests are open to the same objection, namely, the action of the alkali upon chrysophanic acid, when applied to such urine.

This may be the case, for instance, in Penzoldt's diazobenzolsulphonic acid reaction in the presence of strong alkali, the purple color produced by the latter in chrysophanic urine being liable to be mistaken for the red-blue tint produced in diabetic urine.

Source of Error in Diabetic Urine.—We have, so far, considered the liability of chrysophanic urine to be a source of error in examining healthy urine for small amounts of glucose.

But it can also interfere in diabetic urine, and, in some cases, retard the accuracy of certain tests.

In such cases it must be supposed that rhubarb or similar medicines have been administered to a diabetic patient, or one slightly suffering from glycosuria.

Some of the recently introduced tests for glucose, also acting in alkaline media, depend upon decolorization of the test liquid, the glucose present acting as reducing agent. One of these tests is Crissler's reaction with safranine. This is, for ordinary purposes, an excellent reaction, where an accurate quantitative estimation of

glucose is not desired. This test is applied, according to Allen, as follows: Equal measures of urine (2 c.c.) of normal KOH or NaOH solution, and a solution of safranine, 1 part in 1,000 parts of water, are mixed.

The mixture is heated in a test tube, avoiding agitation as much as possible, till freely boiling.

If the urine contains more than 0·1 per cent., the liquid is decolorized; otherwise, the red color remains intact, or is only partially discharged.

If the color is destroyed, the test may be repeated with twice or three times the volume of the safranine solution, which represents roughly 0·1 per cent. of sugar.

If more than four or five measures are required, the urine is diabetic.

If this test is applied to a chrysophanic urine, containing a small percentage of glucose, complete decolorization of the mixture does not take place, due to the action of the alkaline excess upon the chrysophanic acid.

The urine must, however, contain a considerable amount of the latter, or else no material difference is noticeable.

In specimens rich therein, this interfering action can be plainly observed.

Another test, dependent upon decolorization, is based upon the fact that potassium ferricyanide, commonly known as red prussiate of potash, in alkaline solution, is changed to ferrocyanide in the presence of glucose.

It has, however, been shown that uric acid also has the same effect.

To this may be added that, in chrysophanic urine, possibly containing sugar, no such decolorization takes place.

The excess of alkali will color such urine red, which is not destroyed, even upon the subsequent addition of glucose.

The reliability of this reaction as a sugar test is, therefore, open to criticism.

Chrysophanic urine is stated to be eliminated after the administration of rhubarb and senna.

Even the external application of chrysarobin, according to Rosenthal, is stated to produce it in the urine.

In the experience of the writer, after the administration of large

doses of cascara sagrada, urine is eliminated, which has properties similar to chrysophanic urine, although apparently to a less degree than that produced by rhubarb.

After large doses of aloes, the urine sometimes turns darker upon the addition of alkalies, and it was found not to be due to glucose.

Perhaps similar reactions to those described may be obtained with principles which pass through the kidney and give color reactions with alkalies.

As previously mentioned, santonin is stated to possess this property, but to what extent it may influence the reagents mentioned, the writer is unable to state, as, so far, he has been unable to procure a specimen of santonin urine.

Separation of Chrysophanic Acid.—It may be desirable to remove the interfering chrysophanic acid for the further examination of such urine samples. This is best effected by precipitation with basic acetate of lead solution, which, besides the acid, removes also glycuronic compounds.

Subsequent removal of the excess of lead by means of sulphuric acid, and subsequent examination in the usual manner for glucose, becomes necessary.

Animal charcoal will also remove chrysophanic acid from urine.

In presenting this paper to the meeting, the writer is conscious of the fact that many of the points briefly dwelled upon are deserving of more exhaustive treatment. The object has been to call attention to an important matter, which offers a field for interesting research, and of which our knowledge at present is at best limited. The pharmacist can aid scientific investigation in physiological chemistry by a careful scrutiny of different prescriptions, and considering the probable elimination of the prescribed drugs.

By calling the attention of physicians, who can procure samples of urine more readily than the pharmacist, to the importance of this matter, interest can be created and much valuable information can be obtained.

If this receives careful attention and study, a systematic treatise upon the elimination of drugs can be expected in a short time.

KOLA AND KOLANIN.[1]

By Fred. B. Kilmer.

Those who can realize the thoughts of the coal-carrier who went to Newcastle, or him of Shakespeare who gilded gold dollars, colored flowers of the fields, sandpapered ice, and threw the reflection of a candle against the noon-day sun, can imagine the feelings with which I have accepted the call of your committee to read a paper before this body of pharmacal savants. In this noble institution of American pharmacy, the lower-class men can attain a knowledge never reached even in the professor's chair in the school of many of us. For one denied these great privileges to attempt the discussion of a phyto-chemical subject before the faculty of this College, seems highly presumptuous. To be given a topic that has been so ably handled in your journals, in the professors' chairs, and in these meetings, smacks of ridiculous excess. I shall, therefore, at the outset, state that I have come to seek rather than to give information; to ask questions rather than to attempt to anwser them, conceding to my auditors an ability and familiarity with the subject far greater in most respects than my own. We may note here, in retaliation against the ill-timed jests as to the slowness of Philadelphia, that the first scientific reference in this country, to the kola plant, upon which I am to speak, may be found in the American Journal of Pharmacy, in 1865; that the first medical report in America upon its action was published in the Philadelphia *Medical Times*, in 1886. The first full clinical report was from the pen of Dr. Shoemaker, of Philadelphia.

The subject assigned me is the well-worn theme, the Kola Plant. Its history and pharmacognosy are so familiar that we can safely pass them, except to call attention to the botanical specimen of a flowering branch, specimens of the pods, the nuts, photographs taken in the habitat of the drug, together with samples of the dried and undried fruit, all of which I present to your Museum. The kola nuts, as found in our market, come mainly from Africa. The bulk of the West India nuts are consumed by the inhabitants of the islands; a very small part of the crop is shipped to Europe, commanding there a higher price than the African nuts. Lately, small supplies have reached our market from this source. No accurate estimate of

[1] Read before the pharmaceutical meeting of the Philadelphia College of Pharmacy, January 21, 1896

the extent of the world's supply, nor the possible yield for this drug, can be given. The official reports of the African trade give from 2,500,000 to 3,000,000 pounds per year, which is mainly utilized for home consumption. Those who are familiar with tropical products can realize the difficulties and peculiarities of the market in such a commodity. It is carried on mainly through native women. There is a certain amount gathered for home demand. The quantity that will reach the shipping ports must depend upon the caprice of the natives, and especially as to how much they stand in need of rum or tobacco. The crop must all be carried, often hundreds of miles, in head loads, through miasmatic forests, over impassable streams, across pathless mountains, under a tropical sun. The conditions are such that, to gather a ton of nuts and safely land them on a ship that plies along Africa's sunny shores, is a task that one would shrink from after a survey of the field. The native gatherers are shrewd dealers, even if not well skilled in the arts of civilized commerce. They know how to corner supplies, to create a rise in price, and they also know that, when a European buyer wants the nuts badly, grades that have no value at home will find a ready market. This accounts, in part, for the quite variable nature of market specimens. In the West Indies, the governments encourage the cultivation of the plant, and, before many years, ample supplies from this source will be obtainable. In our own country, some attention and discussion has taken place, looking towards its cultivation on our soil. Therefore, the following notes, gathered from observation and from the notes taken in the Botanical Departments of the West India Islands, may be of interest:

NOTES ON THE CULTIVATION OF KOLA.

The kola plant seems to grow well in any climate where there is plenty of rainfall and a warm, tropical sun. Of course, the hotter and more moist the climate, the better. Wherever bananas, nutmegs or cacao will grow, it is safe to say that this tree will thrive. The best kind of soil is that which is deep, rich and clayey, although it will grow in a great variety of soils. In some of the West India Islands, it may be found as high as 5,000 feet above the sea level, but the best specimens are generally found at not over 1,000 feet elevation. If the situation is low and damp, the ground must be well drained. The young plants may be obtained directly from the

seed, planted in the field where they are to grow; but the best results seem to come from planting the seeds in nursery beds, transplanting them when plants are from 2 to 3 feet in height. The seeds as usually obtained from growers are packed for shipment in boxes covered with earth, and the whole wet with fresh water. Holes are bored in the boxes for ventilation. The nursery beds in which they are planted are made of loam, peat or leaf mould and kept shaded. In nursery planting the seeds are put in the bamboo pots commonly used in the tropics, and placed from 9 to 12 inches apart. It takes three to five weeks before the sprouts appear above ground. When ready for transplanting they are set a distance of about 25 feet apart. If the soil into which they are transplanted is not rich, the best planters dig holes several feet deep, 5 feet each way around, and fill in with the topsoil. It is necessary for the young plant to have shade. Many intelligent planters, who have lately taken up the planting of kola, use the banana for the purpose. The banana is a very rapid-growing tree. It shelters the young kola plant and makes a profitable crop while the kola is coming into bearing; kola, in turn, will begin to yield by the time the banana has exhausted the soil. The bananas are planted 10, 11 or 12 feet apart, with the kola at every second banana in the direction of the line. Thus, a plot of 20 feet square is enclosed with banana trees with four kola plants at the corners, leaving the kola from 20 to 24 feet apart. In sheltered situations, as in a low valley between hills that have a growth of woods, the banana is omitted in the centre of the square, to give more light and air. The gradual thinning out of the banana is made as the kola acquires increased growth. Kola is usually planted at the beginning of the wet season. Grown wild, it commences to yield fruit about the fifth or sixth year. Well-cultivated specimens often begin to bear considerably earlier. In the wild state they reach full bearing in the ninth or tenth year. When the kola tree attains full size, it is customary with planters to place in the field with them small varieties of coffee, or some vegetable plants such as peas or yam. Kola gives the necessary shade. The stems and leaves of the other plants furnish a good fertilizer. By this method a kola plantation costs nothing except for the first planting. Kola does not appear to exhaust the soil as does the coffee, banana, orange, etc. Upon once attaining its growth it appears to be of permanent value. Specimens that have borne for fifty years and probably

longer have been noted. Independent of its value for the nuts, kola is an excellent shade and timber tree, and is utilized for this purpose. A conservative estimate of the yield is 120 pounds of dried nuts, or over 250 pounds of green nuts per tree, or from 8,000 to 10,000 pounds per acre. No such amounts, however, are gathered in any portion of the West India Islands owing to the unsystematic and haphazard measures employed in harvesting the crop.

THE PODS AND SEEDS.

Taking up that part of the plant probably of the greatest interest, the seeds or nuts, we may examine the pods, which we will find contain from two to twelve nuts or seeds, so closely pressed together in growing as to be crowded into various shapes. The cellular tissue of the pod before drying is filled with a very slimy, stringy mucilage that is largely absorbed upon ripening. A singular fact noticed about the seeds is the fact that red and white nuts are found side by side in the same pod. So far as my observation goes, pods may be found that contain all red or all white, but no trees give all white or all red seeds. The native users lay great stress upon the difference between the white and red kola nuts. Symbolically, the white nuts mean peace, happiness, veneration, acquiescence to overtures. The red nuts mean the reverse: war, ill-will, challenge, rejection of overtures, etc. In some instances the white seeds command the higher price, being in repute as giving greater and better effects. In the dried nuts found in our market it is difficult to distinguish between the white and red variety. Oxidation during the drying of the seeds gives to both about the same yellow-brown color. When subjected to the action of solvents, white or red nuts (dried) yield to water, alcohol, acetone or glacial acetic acid, shades of orange and yellow which are slightly deeper with the red than with the white variety, but so nearly alike that considerable practice is necessary to distinguish between them. The coloring matter of the red nuts is, however, very soluble in dilute mineral acids. The white and red varieties may be distinguished by macerating for twenty-four hours in dilute sulphuric or hydrochloric acid, when it will be found that the acid extraction of the red kola is a beautiful red rose, while that of the white seeds is of a light straw color. Heckel has shown that if the acid extraction is made alkaline with ammonia, that from red nuts assumes a purplish violet; that from white an ochre-like color.

Several observers have noted that the red nuts give a larger percentage of moisture (Heckel gives 46 per cent. for white, 56 per cent. for red). The same author claims that the white seeds contain 5 per cent. more caffeine, 7 per cent. more of the peculiar principle, kolanin, than the red. My own experiments tend to confirm the observation that there is an appreciable difference in the amount of glucoside found in the white seed as against that found in the red.

ALKALOIDS.

The alkaloids so far identified as belonging to this plant are such familiar substances that any comment upon them is unnecessary. Worthy of note, however, is the fact of their close relationship to each other in chemical formula and structure. Also, that they are analogous and apparently identical with the alkaloids found in all the caffeic group of plants; that they are closely related chemically and physiologically with the xanthine bodies, which are found normally in the muscular and other tissues, such as the liver, spleen, brain substances, etc., of the animal body. These xanthine bodies are typical products of the downward destructive metabolism of proteids. Similarly, the alkaloids of this plant seem to form when the seed is on its way toward removal from the tree.

Xanthine $C_5H_4N_4O_2$.
Para-xanthine $C_7H_8N_4O_2$.
(Dimethyl-xanthine.)

Theobromine $C_7H_8N_4O_2$.
(Dimethyl-xanthine.)
Caffeine $C_8H_{10}N_4O_2$.
(Trimethyl-xanthine.)

Caffeine, as theine, was roughly identified as present in these nuts by Dr. Daniells, and confirmed by Attfield, in 1865, who gave the percentage in the samples examined as 2·13. The second alkaloid, theobromine present in quite small quantities, was separated later. Numerous assays of the drug show greatly varying amounts of these alkaloids. A quite recent assay of the carefully prepared powder is as follows:

ASSAY OF SAMPLE OF DRIED KOLA, BY WENTWORTH LASCELLES SCOTT, CHEMICAL AND MICROSCOPICAL ANALYST, LONDON.

Calculated upon the Substance Free from Hygroscopic Moisture.

Caffeine (or theine)	3·202
Theobromine	·214
Other alkaloids	·065
Kola red and kola orange	3·874
Fatty matter	1·142
Ash	3·955

The experiments made by the writer in the habitat of the plant seem to show that these alkaloids are found chiefly in the ripe or nearly ripe seeds (except that, in a very few instances, the pods have given faint alkaloidal reaction). The wood, bark and leaves give entirely negative results. Experiments are now being made to determine more accurately at just what stage in the life history of the plant these bodies are first manifest. In the limited number of experiments made, the results indicate that, in the green nuts, only traces of the free alkaloids are present, and that the quantity increases materially as the nuts ripen.

KOLANIN.

Heckel and Schlagdenhauffen have set us an illustrious example in the study of drugs by devoting twelve years to the investigation of this plant. Very early in their researches, after exhausting the alkaloids, they separated a body which seemed to them to present an analogy to cinchona red. They found it to contain an active principle which they were at first unable to separate, but which they found to be capable of giving striking physiological results.

Ernst Knebel, of Steeg, in 1891, also a notable name in the history of this drug, in a long and laborious examination, demonstrated that a glucosidal body was present, to which he gave the name kolanin. In his essay he gives several methods of separation, one of which is as follows: The powdered kola is first extracted with alcohol, the extract evaporated to dryness, the finely ground extract then exhausted with chloroform. When the residue is found freed from caffeine, it is mixed with clean sand, washed in cold water until the washings run off slightly colored. (This washing is to remove glucose, tannin and salts.) The washed residue is dissolved in alcohol, filtered, and again evaporated. The product is substantially the *kola rouge* of Heckel. Knebel demonstrated that this glucoside upon decomposition, gave caffeine, glucose and a third non-nitrogenous body. (Knebel's *kola roth*). We should, therefore, remember that Knebel's kola red is a non-nitrogenous body, which, he stated, is joined in chemical union with caffeine as a component part of the glucoside kolanin. Real *kola roth*, as Knebel terms it, is a decomposition product of the glucoside. He shows that it is closely related to the tannins, containing the same number of hydroxyl groups, and giving, upon fusion with caustic potash, pyrocatechin,

formic, acetic and isobutyric acids. He believes this substance is converted into tannic acid during the drying of the nuts. The work of both Heckel and Knebel heretofore referred to upon kolanin was conducted mainly upon the dried drug. It is quite evident, however, from the results obtained by a number of other observers, that, in the undried seed, especially before ripening, little or no caffeine exists as a free alkaloid. In carefully manipulated samples of the unripe nut, the quantity in some instances has been found to be quite small, especially when the nuts are fresh from the tree. It has, so far, been found difficult to separate kolanin free from fat, resinous and extractive matter; the tannin and mineral constituents present in small amounts are also more or less difficult of removal. The glucosidal body itself is also given to decomposition in the manipulations used for removal. Therefore, it may not be strictly correct to say the end product is absolute kolanin.[1]

In the process given by Knebel for the separation of kolanin, even the washing with water causes some change in the glucoside. The kola rouge of Heckel and Schlagdenhauffen is really an impure glucoside, contaminated with glucose, tannin, inorganic salts and some fatty bodies. For their product these authors have given the following properties and reactions: Freed from glucose and fixed salts by precipitation with acetate of lead and sulphuretted hydrogen, it gives a deep green color with iron salts. Ammoniated citrate of iron, with an excess of ammonia, gives a blood-red coloration. Tartarized antimony gives a voluminous precipitate; gelatin, a white precipitate. A solution of nitrate of silver is reduced. The product itself is a brown-red, amorphous, bitter powder, insoluble in cold water, partly soluble in boiling water, in hot water forming a resinous, greasy ball, cooling to a shiny, hard mass. When freed from tannin its solution gives a brown precipitate with alum, with sulphate of copper a dark green precipitate. A precipitate is formed with a solution of iodine in potassium iodide. A more purified form of kolanin is soluble in boiling water, alcoholic solution of

[1] I am also of the opinion that in the processes in common use for the assay of kola, kolanin is not entirely broken up, and, therefore, the whole of the alkaloidal content of the drug is not revealed in the result. Prof. A. R. L. Dohme is of the opinion, however, that, in the process outlined by him at one of these meetings, the glucoside is entirely decomposed. I have suggested to him that he continue his investigations, and have sent him samples of both the dried and undried drug for the purpose.

potassium hydrate and ammonia. Its alkaline solution is red-brown when cold, but becomes red on warming. Its alcohol solutions do not act upon salts of iron, but are precipitated by plumbic acetate. Upon sublimation, this product gives out an empyreumatic oil and traces of caffeine. Upon boiling with dilute hydrochloric acid it is not dissolved, but partly decomposed into glucose and caffeine. As above noted, it is partly broken up by continued boiling in water, and completely by boiling in a dilute sulphuric acid, 20 per cent. strength. Knebel, in his article, demonstrates that the glucoside, kept at a temperature of 60°–70° C. for twenty-four hours, is decomposed into its components, viz.: caffeine, glucose and a third product, non-nitrogenous coloring matter, which he names *kola roth*. In his work he demonstrates the molecular proportions of these constituents. Kolanin is also decomposed by the action of the ferment of the kola, kolazym by the action of the ferments of the saliva and of the gastric juice.

The crude method pursued by the writer in the habitat when working upon the undried nuts was to extract the finely chopped nuts with ether, allow the ether to partly evaporate, then extract both the nut and ethereal residue with chloroform. In the chloroform extraction the caffeine was to be found, in the ethereal solution of the glucoside. This process was first devised as a field expedient, where the laboratory was carried on a mule's back. Its use was afterwards verified in the home laboratory. In practice it was found that ether extracted the water and the glucoside and some caffeine, but left behind some alkaloid; hence, the farther extraction with chloroform was necessary. It was also found that, if the nuts were chopped under ether, alcohol or other liquid, without allowing exposure to air and drying, only a faint reaction for alkaloid would result; whereas, if the nuts were broken open and allowed to dry or partly dry, quite a crop of crystals could be separated. In subsequent experiments it was found that all manipulations which involved the use of heat—such as allowing the nuts to partly or fully dry—cutting them open resulted in quite an increase of alkaloid crystals; also that, when great care was used, with little exposure to air, the avoidance of heat in all stages of the process, the amount of alkaloid was apparently much less. This was afterward confirmed when, in attempting to separate the glucoside, it was found that processes involving heat and exposure to air provoked the breaking up of the glucoside.

From the processes outlined by both Heckel and Knebel, we can readily see that several methods of operation will give the body termed kolanin. For instance, if a solid extract (or an evaporated fluid) be exhausted of caffeine by the aid of chloroform, then washed with cold water to remove such extractive matters as may be soluble, there will remain the kolanin in an impure state. If, in his process, after the exhaustion of the extract with chloroform, the residue is extracted with ether, the kolanin, in a somewhat pure state, will be taken up in the ether, and may be separated by evaporation. After the chloroform is exhausted, I have found it good practice to wash first with petroleum ether to remove some fatty bodies not removed by chloroform, then to follow with the ether extraction. If, in all these operations the solvents and washing liquids are kept faintly acid, there is, seemingly, less decomposition of the glucoside and formation of the tannic-like matters.

FERMENTS.

It has been proven that there is present in this nut an unorganized ferment, to which the name kolazym has been applied. This body appears to possess manifold powers (possibly there is more than one ferment present). Kolazym is a glucosidal enzyme, having the power to split up the glucoside kolanin into glucose, caffeine, and a tannin-like body. It is also a carbohydrate enzyme, giving quite active diastasic action upon starch. It seems to be active in faintly acid solutions, but will act in neutral and feebly alkaline media, acting best at a temperature of about 54° to 65° C. Extreme cold, as well as boiling, seems to destroy its powers. It may be quite readily separated from the undried nuts by macerating the chopped tissue in glycerin and water, made faintly acid, then pouring the glycerin extraction upon dilute alcohol. A fine, cloudy precipitate of proteid matter will be thrown out of the solution, carrying with it the ferment. The precipitate may be further purified by redissolving in water and glycerin, and reprecipitation as before, with final washing in absolute alcohol. Its most active state seems to be in this freshly precipitated and moist condition. Drying over calcium chloride or sulphuric acid seems to inhibit it. Drying by heat almost wholly destroys its power. The separated ferment will convert soluble starch into dextrine bodies and sugar. It will decompose kolanin into its constituents, glucose, caffeine and kola red.

The exact nature and office of plant ferments are somewhat obscure. Prof. J. R. Greene, London, gives as an explanation the fact that, in constructive processes of plant life, an excess of material is formed over and above that immediately utilized; that this excess is temporarily deposited in the tissues, nutritive material of various kinds being found in different regions of the plant. When the constructive process is at rest the action of the ferment is called forth, and the reserve food is made ready for assimilation by a process of digestion, in which the ferments are active factors. Under this view, kolazym may be said to act upon the reserve food stored in the seed. During the resting stage of the seed, it starts the digestion of food for the future plant. In the kola nut, some of the products of this metabolism are the alkaloids caffeine and theobromine; similarly, a product of the metabolism of meat are the closely related xanthine bodies. We find in the ripened seed glucose, which shows the ferment has been at work. It has been stated that in the germinating stage more caffeine is present than when the seeds were first taken from the tree. Prof. Greene claims that the glucoside bodies and their ferments which act upon them are deposited in different cells.

PHARMACOLOGICAL NOTES.

An apology may be due from the pharmacist when he enters the domain of pharmacology, but in my judgment the work of the pharmacist does not end with his chemical assay. To verify or nullify his conclusions, the action of any drug in question upon animal economy must be determined (quite apart and distinct from their action in disease). Under our present methods of drug investigation, this work is left largely in the hands of the medical practitioners, but, of necessity, does not belong there. Not all practitioners of medicine are fully competent to reach proper conclusions in this field, and those who are competent are too busy to carry out any extended researches. If all that were known about the host of new and old drugs was expressed in a table of their chemical constituents, what information would this knowledge convey as to their value in medicine? If kola were an entirely new drug; if its alkaloids, caffeine and theobromine, its glucoside kolanin, were entirely known, should the pharmacist be content to rest on its assay and say to the physician, I find in this drug one glucosidal body and two free alkaloids; the alkaloids are so similar, chemically, that it is

difficult to tell them apart, but here's the value of this drug expressed in chemical symbols? Is this all that pharmacy can do for medicine? Before a drug can be given a place in therapeutics, somebody must first accurately determine its physiological action. The proper value of a drug in medicine will largely depend upon the exhibition of its constituents in their most active condition. The pharmacist must know the physiological action as well as the chemical nature, else how can he make an eligible preparation? The study of any drug is pharmaceutically incomplete until this is done, and without such a study medicine cannot apply it in therapeutics. It seems to me, therefore, pharmacology lies well within the domain of pharmaceutical chemistry. Modern science teaches us that drugs having differing chemical affinities differ in their effects upon the body, while those belonging to the same chemical groups are allied in their action. By altering their chemical composition the place of their action and effect is changed. The chemical constitution of a substance has an important bearing upon the part of the organism which it will affect, so that, in the evolution of science and the application of drugs, medicine must invade pharmaceutical chemistry, or else pharmacy must absorb pharmacology. We may rightly abhor and eschew counter prescribing and pharmaceutical therapeutics, but it seems reasonable that the study of the action of drugs apart from their therapy is a fitting field for the pharmacist. With these thoughts, let us briefly review the pharmacology of the drug before us. By chemical assay we have separated two alkaloids, caffeine and theobromine. As found in the plant, they are so closely combined as to be difficult of separation. Physiologically, their action seems to materially differ from a simple mixture of the same two alkaloids in equivalent proportions. From a chemical point of view we have expressed the value of this drug on its alkaloidal contents, irrespective of all other constituents. Is this the correct and the total value? Is morphine the full measure of the value of opium, cocaine of coca, quinine of cinchona, atropine of belladonna? Is the measure of a drug summed up even by its total alkaloidal contents? Pharmacology would answer no. The alkaloids separate from the drug, while presenting actions that resemble those of the drug itself, by no means replace or fully represent it. A statement by Prof. John U. Lloyd in respect to belladonna may stand for all drugs containing alkaloids:

"Neither a solution of atropine nor of the salts of atropine or hyoscamine in proportion to correspond to those obtained from the alcoholic extract or tincture of belladonna, seems to possess the full qualities of the alcoholic extract or a percolate of good belladonna. Hence, admixtures of extractive with the purified alkaloids cannot fully replace natural belladonna extractives that are of the same alkaloidal proportions.

"For this reason, phyto-chemical analysis does not altogether determine the comparative therapeutic value or physiological energies of belladonna preparations, or that such as are deficient in alkaloid are correspondingly inferior."

In the drug under consideration, an assay[1] from various authorities shows, besides the alkaloids named, sixteen other substances set apart and named. Some of these groups include a still larger number of separate constituents. Are these constituents no factor in the influence of the drug upon the organism? The physiological action of the drug, as reported by a host of observers, is far different from that of caffeine or any drug of the caffeine group. One record of observations, showing its influence upon muscular contractions, shows that caffeine acts upon the height of the contraction. The action of caffeine increases these, but the effect is of short duration, the amplitude being very restricted. The muscle is

[1] Caffeine	2·348
Theobromine	0·023
Kolanin	1·290
Fat	0·734
Essential oil	0·081
Resin	1·012
Tannin	1·591
Glucose	2·875
Saccharose	0·612
Mucilage	3·040
Starch	30·990
Dextrine	2·130
Soluble salts	0·070
Ash	3·325
Albuminoids	6·325
Coloring	2·561
Moisture	10·117
Cellulose, etc.	30·876
	100·000

exhausted as rapidly, even more so than in the normal state. The drug kola acts upon the number and intensity of the contractions. The duration of the contractions is greater, the amplitude is larger and longer sustained. The decrease which follows is in a very regular progression. (DuBoise.)

Dr. H. Marie has shown, by a series of comparative tracings, that with caffeine the starting contractions are very elevating, but there is a sudden fall reaching below the starting point; while with kola there is a gradual elevation, which is continued until the drug begins to lose its influence, when the descent is very regular and gradual to the normal point. It is characteristic of caffeine and of other stimulating drugs that there is a depressing action, but there is none with kola. This has been verified by Drs. Smith and Leuf, who, in connection with Dr. Woodbury, recently made some interesting studies of this drug. A series of sphygmograph tracings made by them show an undoubted increase of the pulse and heart action, with no reaction thereafter. Thus we can see that the free alkaloids by no means account for the full value of the drug. The action of the other constituents, save one or two, has been barely touched upon. The essential oil has been defined as a tonic of the generative organs. Whatever action or influences lie in the substances grouped under the head of resinous matter and fatty bodies, etc., at present are unknown. In the light of pharmacology, one constituent, however, seems to be far superior in power and action to that of the other alkaloids, and gives the drug its place and rank. It is the substance termed kolanin. Observers have reported that this substance separated from the drug (containing, of course, no free alkaloids) "in very small amounts, increases the intensity and duration of the muscular contractions." The amplitude of the contractions is preserved longer than with the drug itself. The conservation of the muscular energy is in marked contrast with that of the alkaloids separated from the drug, exercising a well-defined action peculiar to itself. Dr. Edouard Heckel strongly reiterates and produces a vast amount of testimony as to the marked difference and superiority between the action of kolanin and that of the free alkaloids from the drug, and of the other substances of this class. Several other observations made recently in this country show a very marked action of this drug after exhaustion of all the free alkaloids. But, so far, all our studies upon this

plant and those of its class have given but a feeble light upon their whole nature. There are still formidable difficulties to surmount before we can say we have reached the ultimate truth. From a chemical point of view, the three presumable ultimates separated seem to carry in part the energy of the original plant. Of these three, two are alkaloids, of which we can sum up our knowledge by saying they are very closely related, yet they are very different. We do not know as to their origin, are not agreed as to when they begin to form, cannot tell how far the life and death processes within the plant, or how greatly the chemical reactions in our test tubes, have had to do with their formation, their increase or decrease in amount. When we have separated these two alkaloid bodies and given a chemical measure to the drug, there remains in our apparently worthless residue one substance at least, which has been named kolanin, to which pharmacology assigns a higher value than to all the rest. Chemistry can only, by hard work, partly pull it to pieces. It has not yet fully decided as to its final products.[1]

Then we have the ferment body kolazym. Authorities sum up our present knowledge of this class of substances by saying: "Chemically, we know nothing of them, except that an apparently small and immeasurable quantity may affect the constitution of a large quantity of certain other chemical compounds. Their action seems to be the breaking up of large molecules with which they come in contact with smaller molecules." The most that we can say of kolazym is that it is present in the plant and can define its apparent powers. Among the many problems that arise, may we not rightly ask that if by any means we could gain full control of this plant in its manifold stages of life, could we so direct its course that it might go on at our command, producing the peculiar glucosidal body kolanin, could we so govern the action of this ferment as to compel the continuous production of glucose, caffeine and other products? Are conditions possible whereby the yield of glucosides and consequent alkaloids could be increased? Could we here secure a perpetual fountain of chemical products? At

---

[1] In manipulating the tannin-like compound of Knebel, it is extremely difficult to readily effect a complete separation of the alkaloids. They are either very adherent or form slowly during the breaking down of the original substances, so that, at times, even after hours, extending into days of extraction, faint reactions of caffeine are observed.

present, we dare not even attempt a penetration into the depth of the dead or the vitalized plant as to the compounds we have grouped in our assay as "matters." We may, therefore, turn from our chemical research to the pharmacist's ever-ready crucible, his trained and trusted senses. Take an undried seed of our Sterculia plant, prick through its skin coating or break it open. Mark the result. In a space of time that is not measurable, the color of the flesh within the tissue assumes an orange brown color rapidly extending over the whole abrasion. It goes on until the whole structure assumes this hue. What are those wondrous transformations that take place before our eyes? Is it not reasonable to assume that if our assay had been made before the tissue had been broken, it would have given different results than if made a few seconds afterwards? In this little act have we not in some way loosened the dormant chemic life stored within, and made its operations visible? Who can measure the infinitesimal energies evolved? By the prick of a pin we have started a chemical factory in motion, have involved reactions, equations so great that the scientific mind cannot calculate them. Bite off a piece of the nut and chew it. At first the taste is bitter and acrid; under the grinding and mastication this changes to a sweet. The tongue and palate reason out glucose without the aid of Fehling's solution. Swallow the juice or the masticated substance, put your finger upon the pulse or heart, measure the beats and their force. They are stronger and more regular. Measure the contractions of muscular energy, try their vigor and test their power of endurance. The intensity and force is amplified. The brain, nerve and muscle have received an impetus and derived power from the energy stored within a little nut-shell. Is it because the plant contains the essence of energy or the alkaloid of power? Can we not more truly say that there is a definite chemical affinity between the several molecules of its constituent compounds and the molecules of the nerve organism, with stimulation and vigor as links in the chain? The native users of this plant endowed it with miraculous powers. An Arabian physician, a few centuries ago, named it the "tree of heaven." To-day, the medical and lay journals of Europe and America tell a story of a "wonderful tropical nut," "a marvellous drug from Africa." This somewhat crudely indicates our exact knowledge concerning it. A distinguished American botanist recently described this plant as, to him, the most fascinating and myste-

rious specimen of Nature's handiwork. A professor in one of our pharmacy colleges says that he dimly sees within and through its mysterious processes the key to all our alkaloid-bearing plants. When the door shall be wide opened and all is made plain, the influence and value of the discovery to science and medicine, he believes, will be so great that it may be counted with the "proin" of Berzelius, the "dawn of the day."

NOTE ON THE CHEMICAL COMPOSITION OF SOME MUCILAGES.[1]

By K Yoshimura.

The mucilage, or saccharo-colloids, hitherto analysed, have been found to consist, in most cases, of saccharo-polyanhydrides of either glucose, galactose, mannose, or arabinose. Only in one case was the mucilage shown to consist of a mucin (*Ishii*, Vol. II, No. 2 of this Bulletin).

Although such compounds are widely distributed in the vegetable kingdom, they have been investigated but in a very limited number of cases. As it is of physiological interest to know the composition of mucilages in as many plants as possible, I have examined those of the following species:

(1) *Sterculia platanifolia* (young shoots).[2]
(2) *Colocasia antiqurum* (tuberous roots).[3]
(3) *Opuntia* (fleshy stem).
(4) *Vitis pentaphylla* (stems and leaves).
(5) *Œnothera Jaquinii* (stems and leaves).
(6) *Kadzura Japonica* (young leaves and stems).

The concentrated slimy extracts were precipitated with strong alcohol, and the precipitates, after having been washed with alcohol, were boiled with sulphuric acid of 2–4 per cent. for 2–5 hours, the liquid neutralized with barium carbonate, and the filtrate evaporated to a syrup.

A portion of this syrup was evaporated with nitric acid to observe whether mucic acid was formed.

---

[1] From Bulletin of Imperial College of Agriculture, Tokio, Japan. Vol. II, No. 4.

[2] The mucilage of *Sterculia platanifolia*, as well as that of *Kadzura Japonica*, finds technical application in this country, being used for sizing paper, etc.

[3] The tuberous root stock of *Colocasia antiquorum* serves as a valuable food in this country, and is hence cultivated to a large extent.

Another portion was mixed with a cold concentrated solution of acetate of phenylhydrazine to observe whether mannose-phenylhydrazine was formed.

Another portion was examined with phloroglucin and hydrochloric acid for the presence of pentoses. And, finally, the osazones were made in the usual manner, and, after purification by recrystallization from dilute alcohol, their melting points were determined. In this manner I was enabled to come to the conclusion that the mucilage of *Sterculia platanifolia* consists of a mixture of araban with some galactan; and that of *Colocasia antiquorum*, since it gave neither mucic acid nor the pentose nor mannose reaction, but an osazone which was proved to be identical with phenylglucosazone, consists probably only of a polyanhydride of *d*-glucose.

The mucilage of *Vitis pentaphylla*, as well as that of *Opuntia*, consists principally of galactan, while those of *Œnothera Jaquinii* and of *Kadzura Japonica* contain galactan and araban.

THE CHEMISTRY OF INDIAN HEMP.[1]

An attempt has recently been made by F. Marino-Zuco and G. Vignolo to determine definitely what are the active principles of *Cannabis indica* (*vide Gazetta Chimica Italiana*, 1895, part 1, pp. 262–268).

On exhausting the crude drug, by boiling it with water acidulated with sulphuric acid, they obtained an alkaloidal substance which, when converted into hydrochloride, formed a colorless, deliquescent, crystalline mass, about 4 or 5 grammes only being obtained from 50 kilos of the drug. The physiological action of this salt showed it to be a powerful cardiac depressant, much more active than the product from *Cannabis sativa*.

But the authors have succeeded only in adding to the difficulties which already beset the subject. Polli has pointed out that vegetable acids destroy or invalidate the physiological action of *Cannabis indica*. It was not to be expected, therefore, that still stronger acids would extract the active principle or principles on which the value of the drug depends, the chief value of *Cannabis indica* being as a soporific and calmative in the sleeplessness of melancholia, and as

---

[1] *Pharmaceutical Journal*, December 21, 1895.

an anti-spasmodic in tetanus, etc., one of its most marked characters being its peculiar action on the brain.

The experiments of T. and H. Smith, in 1846, showed that the soporific and other properties of the drug were contained in the resin, and, during the last fifty years, no further information of practical value on the subject has been forthcoming. In 1876, Preobrensky obtained from Indian hemp a volatile alkaloid, supposed to be identical with nicotine, but Dragendorff suggested that this was due to tobacco mixed with the drug, the two being often smoked together. In 1881, Siebold and Bradbury extracted a volatile alkaloid, in very minute quantity, to which the name cannabinine was given, and in 1883, Matthew Hay obtained, in minute quantity, a crystalline alkaloid which possessed a tetanic action. This was called tetano-cannabine, and was stated by Jahns, in 1889, to be identical with choline. In 1891, H. T. Smith extracted an alkaloid of varnish-like consistence, with an odor resembling that of coniine, and forming a sulphate that could be crystallized from alcohol. The cannabin tannate of Merck (1889), the pure cannabin of Bombelan, and the cannabindine of Kobert, can scarcely be regarded as pure active principles.

The chemistry of this remarkable and powerful drug still remains to be elucidated, therefore, and the active principles to which its complex action is due yet await isolation. It may, perhaps, serve as a hint to investigators, to recall a statement which appears in Schlimmer's (Persian) "Pharmacopœia" (p. 102), from which it appears that the dervishes make an extremely somniferous preparation by boiling the tops of Indian hemp in fresh butter or oil of almonds. "Of this a sufficiently minute quantity introduced into an ordinary culinary preparation will cause an entire family to sleep for twenty-four or seventy-two hours, without the taste of cannabis being detected." Assuming the intoxicant action and the odor of Indian hemp to be due to a volatile constituent likely to be driven off by the boiling process, the use of oil as a solvent might serve to separate the most important active principle, and another might be separated by distillation. Hitherto most of the processes adopted appear to have yielded products incapable of causing the characteristic action of the drug.. It may be pointed out, by the way, that the Bengal drug, in rounded or rolled pieces, is much richer in resin, and three or four times more powerful than the ordinary drug.

EDITORIAL.

PRODUCTION OF SODA IN THE UNITED STATES.

Some facts with regard to the American production of soda have been recently published in the *Engineering and Mining Journal* for January 4th, which are sufficiently interesting to reproduce for our readers.

The production of soda in the United States is increasing rapidly, and the output for the year 1895 was about 161,000 metric tons, counted as 58 per cent. ash.

The great Solvay Works, of Syracuse, N. Y., are preparing to increase capacity by 50 per cent. through their new Detroit Works. The Mathieson Alkali Company, at Saltville, Va., is also preparing to make a large output of ash and caustic during the coming year, and is now working the Castner electrolytic process with excellent results. This company has a magnificent plant, and will, no doubt, become a very important factor in the market.

The neighborhood of Detroit will shortly become a great, if not the greatest, alkali-producing center in the United States. Besides the new Solvay works, already referred to, the Michigan Alkali Works, at Wyandotte; Church & Co., at Trenton; and two other projected works, are all in the vicinity of Detroit.

The Standard Oil Company is also proposing to operate alkali works at Cleveland, O., and there are two or three other projected works in other parts of the country. There is every prospect that, in a few years more, the United States will not only make all the alkali required for domestic consumption, but it will, before many years, export to other markets, as the cost is constantly being reduced by increasing production and by utilizing waste products.

The Castner electrolytic process, above referred to, has been working on a commercial scale for some time now at Oldbury, near Birmingham, England, where caustic soda and chlorine are successfully produced from brine. The alkali solutions obtained contain 20 per cent. caustic, and yield, by direct evaporation, solid caustic of almost chemical purity (78·5 per cent. Liverpool test) a product to this time unknown in the alkali trade. The Castner-Kellner Alkali Company, who own the patents, are putting in a plant at Oldbury of 4,000 horse-power capacity, which will produce 18½ tons of pure caustic soda and 40 tons of bleaching powder daily. The present annual production of caustic soda in Great Britain amounts to 160,000 tons, while that of bleaching powder is 150,000 tons.

S. P. S.

The Zeitschrift des allgemeinen österreichen Apotheker-Vereins, in its issue of January 1st, celebrates its fiftieth anniversary with an enlarged number, made up of original contributions of a high order, from the pens of some of the best-known writers associated with pharmacy in Europe. Professor A. Vogl contributes a paper on *Jaborandi Leaves;* Professor A. Hilger, one on *Columbin and Colombic Acid;* Professor Dr. J. Wiesner writes on the *Source of Dammar;* Professor J. Moeller, on *Liquidamber and Storax*, and Dr. S. F. Hanausek, on *Cinnamon Chips*. A number of these papers are accompanied by illustrations.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

ESSENTIALS OF VEGETABLE PHARMACOGNOSY. A TREATISE ON STRUCTURAL BOTANY, DESIGNED ESPECIALLY FOR PHARMACEUTICAL AND MEDICAL STUDENTS, PHARMACISTS AND PHYSICIANS.

PART I. The Gross Structure of Plants. By Henry H. Rusby, M.D. PART II. The Minute Structure of Plants. By Smith Ely Jeliffe, M.D. With 560 illustrations. New York: D. O. Haynes & Co. 1895.

The book which these authors have produced is, on the whole, a welcome addition to the literature of the pharmaceutical profession.

In Part I, Dr. Rusby, after a brief introduction, takes up, first, the flower, then in succession the fruit, the seed, the embryo, germination, the root, the stem, the leaf and, finally, anthotaxy. This order of presentation of the subjects might well be objected to on the ground that one of the most difficult parts of botany is placed first. But that much more depends upon the method of treatment than upon the point of beginning, is in the present instance well-nigh justified by the result, for the author has made his exposition of the floral structure so simple and clear that the student need find no serious difficulty with it. In fact, the author has succeeded in presenting his whole subject in a very clear and attractive way. Too many works which purport to give only the essentials of a vast subject are mere skeletons, uninteresting, forbidding; but Dr. Rusby's book is far from being of this class. While probably it would not profess to be original in the sense of presenting facts heretofore unknown to science, nevertheless, it is original in the freshness with which already well-known facts are presented. They are presented in such a way as to enlist interest and awaken thought.

The author shows himself to be so much a master of his subject that he need give little heed to the beaten paths. With the instinct of the true botanist, he often prefers to go "across lots," and this fact adds much to the value of the book.

This part of the book is very fully illustrated, and the illustrations, while simply executed, are nearly always telling and true to nature. The larger portion of them are also original. In the opinion of the reviewer, however, the value of these illustrations would have been considerably enhanced had they been accompanied by descriptions. In some instances the plants from which the drawings are made are not even named in the text.

A protest is recorded here against the continued use of the terms *primine* and *secundine* as names for the coats of the ovule. Some recent writers, among them Dr. Rusby, employ the term *primine* to designate the inner coat, because it is the first formed, while they apply the term *secundine* to the outer and later-formed one. Many other botanists, however, reverse the order, calling the outer coat the primine, and the inner the secundine. This is most confusing, and it would be wiser to abandon these names altogether in favor of the simpler terms *inner* and *outer* integuments.

Part II, though on the whole well up-to-date and written in the modern spirit, is scarcely up to the level of Part I. It is less careful in its statements, less free from errors. On p. 115, for example, it is stated that "the lining membrane is called the cell-wall;" on p. 116, that "it (referring to the cell nucleus) consists of a nuclear membrane," etc.; on p. 119, that "starch is

found throughout the vegetable kingdom;" on p. 121, that "microchemically, acids have no effect on calcium oxalate;" all of which statements are more or less misleading.

Also, on p. 126, a drawing of a root-tip is given, and the axial part is pointed out as the periblem, and the zone exterior to this as the plerome, which is not in accord with such excellent authorities as Strasburger and Vines, nor with what Dr. Rusby says in the first part of this same book.

In the accompanying text, on p. 127, the following statement occurs: "*Beneath* this (that is the dermatogen) lies the plerome which gives rise to the fibro-vascular system, and *within* is the periblem, from which the ground tissues arise." (The italics are ours.) This statement renders confusion worse confounded. All of this shows that in Part II the proof-reading was less carefully done than it ought to have been, a defect which, it is to be hoped, a second edition will rectify.

This part is also copiously illustrated and the drawings are good, though it is to be regretted that the author has been obliged to credit nearly all of these to German authors, instead of giving us original ones.

EDSON S. BASTIN.

A STUDY IN PHARMACY. By J. U. Lloyd. Cincinnati, O., 1894.

Something over a year ago, Professor Lloyd commenced mailing to his friends the pages of a work that at first was decidedly a puzzle to them. The first part issued was entitled "Preliminary," the second part "Generalities;" these occupied over two fasciculi, and then the subject of "Experimentation" was taken up. Later, "Chemical and Pharmacal Compounds" were discussed, but still the plan and object of the work were not apparent.

More recently, the author has thrown some light on the drift of the work by discussing the less comprehensive subject, "Capillarity." This subject he has commenced with a short outline of study, and then follows an elaborate list of references to the literature of capillarity. This index commences with the year 1452, and, up to this writing, it has reached the year 1857, with 222 separate references. If the author completes this valuable reference list, which he has copiously amplified with brief abstracts, he will confer a lasting benefit on all those who have occasion to pursue this interesting study.

We hope these contributions will continue to reach us in rapid succession.

THE PRINCIPLES AND PRACTICE OF AGRICULTURAL ANALYSIS. Volume II, Fertilizers. By Harvey W. Wiley. Easton, Pa.: Chemical Publishing Company. 1895.

The first volume of this work was devoted to soils, and was reviewed in this JOURNAL just one year ago. It was then thought that the second volume would complete the work; but the author found that the subject of fertilizers alone made, with index, 332 pages, so it was decided to start a new volume, which is now coming out in monthly parts.

Volume II is divided into four parts: Part I is devoted to "Phosphates and Phosphatic Fertilizers;" Part II considers "Nitrogen in Fertilizers and Fertilizing Materials;" Part III treats of "Potash in Fertilizing Materials and Fertilizers;" and Part IV concludes with a survey of "Miscellaneous Fertilizers."

The analytical side of the subject is very fully discussed, and illustrated with very practical apparatus. To the chemist this volume will be of even more

value and interest than Volume I. The citation of authorities has been judiciously and abundantly made throughout the work.

THE DISCOVERY OF OXYGEN AND ITS IMMEDIATE RESULTS, INCLUDING THE OVERTHROW OF THE PHLOGISTON THEORY.

Reprinted from a series of articles in the *Pharmaceutical Journal,* which, we presume, were from the ready pen of the editor. The reprint makes a pamphlet of 59 pages, and it is a scholarly account of the investigations of Priestley, Scheele, Cavendish and Lavoisier. Its publication at this time is especially opportune, since the one-hundred-and-fiftieth anniversary of the birth of Scheele was celebrated a short time ago, and the centenary of the death of Lavoisier, the founder of modern chemistry, still more recently.

All of these men were more or less connected with pharmacy, as it existed in their day, and this account of them is of interest to pharmacists for that reason. At the same time, it enables one to understand more clearly the wonderful progress that has been made in chemistry during the nineteenth century.

STATE CONTROL IN MEDICINE: an introductory address to the sixty-fifth lecture course of the Albany Medical College. By Willis G. Tucker, M.D.

ON THE RELATIONS OF CHEMISTRY TO EDUCATION. By William H. Seaman, M.D.

An address of the retiring president before the Chemical Society of Washington, D. C.

CONTRIBUTION A L'ÉTUDE DU PSIDIUM POMIFERUM, L. Par Joseph Khouri. Thesis presented to the *École Supérieure de Pharmacie,* Paris, for the diploma of pharmacist of the first class. Paris: Le Bigot Frères. 1895.

ANTITOXINES, VACCINE VIRUS, AND OTHER BIOLOGICAL PRODUCTS, issued by the Biological and Vaccinal Department of the New York Pasteur Institute, New York.

This pamphlet of 28 pages gives some account of each of the serums prepared by the above Institute, and for sale by their agents, Messrs. Lehn & Fink. It is a satisfaction to know that we have the means of producing these serums in this country, and that they are supplied in both the liquid and the dry state.

FORESTRY FOR FARMERS. By B. E. Fernow, U. S. Department of Agriculture. Washington: 1895.

THE COMPOSITION OF EXPIRED AIR AND ITS EFFECTS UPON ANIMAL LIFE. By J. S. Billings, M.D., S. Weir Mitchell, M.D., and D. H. Bergey, M.D. Smithsonian Contributions to Knowledge, No. 989. Washington, 1895.

VIERTELJAHRESSCHRIFT UBER DIE FORTSCHRITTE AUF DEM GEBIETE DER CHEMIE DER NAHRUNGS- UND GENUSSMITTEL. Von Dr. A. Hilger, Dr. J. König, Dr. R. Kayser and Dr. E. Sell. Berlin: Verlag von Julius Springer, 1895.

The third number of the tenth volume of this interesting publication is fully up to the standard of its predecessors. The abstracts cover nearly everything relating to foods, and a valuable bibliography of all recent books on foods and food products is appended.

NOUVEAU PROCÉDÉ POUR LA PRÉPARATION DE GRANDS EXEMPLAIRES DE CRISTAUX. Par Raymond van Melckebeke. Reprint from *Annales de Pharmacie,* Louvain, 1895.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, January 21, 1896.

The fourth of the series of Pharmaceutical Meetings was held in the Museum of the College, at · o'clock.

Mr. Joseph W. England was called to the chair, and the reading of the minutes of the previous meeting was dispensed with.

The first paper, entitled "Kola and Kolanin," was presented by Mr. F. B. Kilmer, of New Brunswick, N. J. (See page 96.) This paper is a valuable one, from a chemical and pharmacological standpoint, as showing the results of the most recent research along these lines, and, with so much data at hand, the value of this drug in therapeutics would seem to be pretty thoroughly established. Mr. Kilmer rendered his paper all the more interesting by showing photographs from the habitat of the kola plants, illustrating their appearance as seen growing in the native forests, and the industries connected with the collection and preparation of the nuts for market, and also by exhibiting specimens of the fresh and dry nuts from various tropical countries, and an original package of the African nuts, as well as some which were partially decomposed, owing to the attack of a fungus growth.

Several important questions were presented in the discussion, which may be summarized as follows: Mr. England desired to know whether kolanin can be obtained in the crystalline form, and also whether the African nuts are superior to those from other countries. Mr. E. M. Boring wished to know in what manner the drug is used by the natives. Prof. Trimble referred to the author's experiment in cutting the fresh nuts under ether to obviate the action of the air on the glucosidal principle, and mentioned the difficulty of extracting the active principle of drugs with chloroform or ether in the presence of moisture, and suggested the use of absolute alcohol in operating upon the fresh drug. He also confessed to some skepticism on the subject of the wonderful physiological properties ascribed to kolanin, and wondered, after all, whether the effects of the drug were not really those of the caffeine which is produced by the action of the ferments in the saliva and gastric liquids on some of the constituents of this drug, and whether the difference between a dose of kola and one of caffeine is not the result of a slower absorption of the caffeine from the kola, since the kolanin must first undergo slow decomposition.

Mr. Kilmer, in replying to the preceding questions, said that he had as yet been able to obtain kolanin only in the amorphous condition; and, in considering the relative value of kola nuts obtained from different localities, the difference in the results, as obtained by analyses, he thought to be due to the method of curing them, and to the proportion of diseased nuts, the latter having been proven to be worthless. He also mentioned the difference in taste between samples that had been carefully dried and those prepared by the natives. This industry is mostly carried on by native women, who select the most perfect nuts and place them in the ground and loosely cover them with leaves and earth, so that the air shall not be entirely excluded. Here they are allowed to remain about one month, when they are examined again and the defective ones rejected. When the yield is small, they are carried over from one season to another, although, in some countries, large quantities are never gathered. The natives all use them and depend simply on chewing them to obtain the effects.

Mr. Kilmer further stated that he had used acidulated alcohol in extracting the fresh nuts, by cutting them under it and macerating, and had obtained different results than when they were previously prepared in the open air. With reference to the active constituents, he said that the testimony of physicians was to the effect that there is a marked difference in action between kolanin and caffeine; and, in considering kolanin as an article of commerce, it is very difficult to separate, and keeps better in solution, the problem of preparing it in an eligible form being one for the pharmacist to work out. Two samples of this substance were shown, one in the moist condition and the other in the dry form, the latter being much darker in appearance, owing to the production of kola red on exposure.

A vote of thanks was tendered Mr. Kilmer for his paper and presentations of photographs and specimens.

The second paper was read by Mr. F. W. Haussmann, and was entitled "The Influence of Certain Medicinal Compounds on the Character of the Urine." (See page 84.) This paper gave evidence of having required no small amount of work in its preparation, and showed how wide the field for study in this branch of chemistry is becoming, and especially so since the introduction of the large class of synthetic remedies, and also how the physician and pharmacist may work with one accord in the development of a science so important in the study of pathological conditions.

The last paper was presented by Mr. Lyman F. Kebler, and was entitled "A Comparison of the More Recent Methods for the Assay of Cinchona Barks." (See page 79.) Mr. Kebler is rendering technical pharmacy high service in thus studying and comparing different assay processes, and, at the same time, a practical advantage is gained in the selection of methods best adapted to the needs of the pharmacist.

Attention was called to two samples of denarcotized opium, and, from the difference in appearance, it would be well for pharmacists to exercise some discrimination in buying this drug.

Mr. Geo. M. Beringer sent samples of liquid vaccine virus which is said to be absolutely aseptic. The liquid previously sterilized is hermetically sealed in glass tubes, and dispensed in them so that no contamination can occur.

Mr. Chas. Bullock presented a specimen of a patented chemical which is used for dyeing purposes. It is called "sal americ," and is a combination of fluoride of antimony and sulphate of ammonium.

On motion, the meeting adjourned.

T. S. Wiegand,
Registrar.

MINUTES OF MEETING OF THE PHILADELPHIA COLLEGE OF PHARMACY.

William J. Jenks, Vice-President, presided at the stated meeting of College members, held December 30, 1895. Nineteen members were present. As is usual, the minutes of the previous regular meeting were confirmed, and the records of transactions of the Board of Trustees for the months of October, November and December were approved. The Committee on Delinquent Members,

who had recommended an amendment to the By-Laws, in a substitution, Chapter VIII, Article V, now moved the adoption of said amendment, the usual interval of notification having elapsed. (This amendment will be found in full under the College minutes, in the November, 1895, number of this JOURNAL.) It practically provides for a class, to be known and designated as associate members, who shall pay $3 annually *in advance*, instead of $5, the dues of regular, active members. These associate members have all the privileges of active members accorded them, except that they *are not granted the right to vote*, nor *can they hold office*. By compliance with the conditions and terms of payment already established, any associate member may elect to become an active member. This amendment was adopted by a unanimous vote.

It was verbally stated that a Committee of Apothecaries, representing the hospital stewards and naval apothecaries, were about to petition Congress in a bill providing for a better recognition and status of this arm of the National Service, and higher grade of pay; also that this College had been solicited to use its influence in favor of this bill. After discussion, it was resolved that the secretary be instructed to address the Honorable Secretaries of War and Navy, as also the Committee on Naval Affairs, expressing the sense of approval of this College, and urging the favorable consideration of the provisions of the bill.

The Secretary of the Board of Trustees submitted the following names of gentlemen who had been elected honorary and corresponding members, respectively. On motion, the action of the Board was approved, and the nominations confirmed.

Honorary Members: J. H. Maiden, Sydney, New South Wales; Dr. Oscar Loew, Tokio, Japan; P. L. Simmonds, The Charter House, London, England; Prof. F. E. Lloyd, Forest Grove, Oregon; Dr. F. Hoffmann, New York.

Corresponding Members: A. E. Wild, Darjeeling, Bengal, India; William Fawcett, Gordon Town, Jamaica.

HENRY TRIMBLE,
JOSEPH P. REMINGTON, } *Committee.*
CHARLES BULLOCK,

On motion, meeting adjourned.

WILLIAM B. THOMPSON,
Secretary.

The Agricultural Gazette, of New South Wales, states that there is still living at Kenmore, in excellent health, Mr. Charles Ledger, the man who, forty years ago, after most perilous adventures, introduced the variety of Cinchona Calisaya, known as Ledgeriana, into the island of Java, and not much afterward introduced a flock of alpacas and other animals from South America into Australia, which have been of priceless value to that country. Messrs. Howard & Sons, the great quinine firm, say that the supply of Peruvian bark from Java is almost all from the Ledgeriana trees, the only complaint against this variety being that it has turned out so rich that the trees are supplying too much quinine for the world to consume. Perhaps the quantity of bark which is now produced every year from seed furnished by Mr. Ledger cannot be short of 10,000,000 pounds, and to him, more than any one else, perhaps, is due the fact that quinine has been brought within the means of the very poorest.

THE AMERICAN
JOURNAL OF PHARMACY

MARCH, 1896.

THE SHADDOCK, GRAPE FRUIT AND FORBIDDEN FRUIT.

By Chas. H. LaWall.

Shaddock and Grape Fruit, Citrus decumana, Willd.; Forbidden Fruit, Citrus Paradisi, Macf.; natural order, Rutaceæ.

In October, 1895, the author of the following communication was requested by Prof. Trimble to take up the subject of the grape fruit or shaddock, and, after reviewing the literature, to write a paper considering the subject from its botanical, economical, pharmaceutical and chemical standpoints. Before submitting the results of his work, the author wishes to confess his inability to do justice to the subject, the magnitude of which was fully appreciated shortly after the work was commenced. It is hoped that this apology will atone for any incompleteness which may be evident to those who are thoroughly familiar with the subject.

In considering the flora of a given locality, the customary method of procedure is to arrange the plants in the following order: (1) Indigenous plants; (2) Plants which have become perfectly naturalized; (3) Plants under successful cultivation. According to this order of preference, the members of the Citrus genus would be of tertiary importance in most sub-tropical countries, which is clearly incorrect, as the commercial value of the fruits of this family entitles them, in many instances, to be considered as primary features in the flora of any locality.

Although the genus is of such a widespread character at the present time, it was originally indigenous to a small portion of Asia.

The introduction into most sub-tropical countries and the subsequent success which attended the cultivation of its members has given origin to numerous varieties, which renders the differentiation and systematic classification of varieties and species a task of great difficulty.

The generic name *Citrus* is mentioned by Wittstein as being of African origin. He also mentions several Greek forms of the word —*χιτρεα*, *χιτρια*, and *χιτριον*.[1]

Many different opinions have been advanced concerning the exact locality of the origin of this important genus. Among the localities advocated by various authorities, may be mentioned India,[2] China,[3] Malay Islands,[4] Cochin China and Japan,[5] and tropical Asia.[6] The entire territory subject to dispute might easily be included in the term tropical Eastern Asia, which is specific enough for general use and has the advantage of being less open to criticism.

What is true of the genus in general is true of its members individually, consequently the origin of the shaddock is not definitely known. De Candolle[7] mentions that it does not occur wild in the Malay Archipelago, but that the number of varieties under cultivation would indicate an ancient origin. He also makes the statement (in opposition to Rumphius, who believed it to be a native of Southern China) that, while the species has a simple spoken name, *yu*, the written character appears to be too complicated for a truly indigenous plant. He mentions that indications of a wild existence are found in the islands east of the Malay Archipelago; that it is very common n the Friendly Isles and the Fiji Islands, where it covers the banks of the rivers, and concludes by saying that "it would be strange if a tree so much cultivated in Southern Asia should be naturalized to such a degree in certain islands of the Pacific, and scarcely be found elsewhere." In regard to India, it is stated[8] that there is no San-

---

[1] 1856, Wittstein, *Etymologisches Botanisches Handwörterbuch.*

[2] 1763, Linnæus, *Species Plantarum;* 1815, Pursh, *Hortus Catalogiensis;* 1862, Bentham and Hooker, *Genera Plantarum.*

[3] 1837, Jas. Macfayden, *Flora of Jamaica;* 1879, Chas. Pickering, *Chronological History of Plants.*

[4] 1875, J. D. Hooker, *Flora of British India;* 1888, Encyclopedia Britannica.

[5] 1828, Rees' *Encyclopedia;* 1866, Loudon's *Encyclopedia of Plants.*

[6] 1885, *Index Kewensis*, Vol. I.

[7] 1885, Alphonse de Candolle, *Origin of Cultivated Plants.*

[8] 1890, *Pharmacographia Indica.*

skrit name for the shaddock, which grows in abundance, and that in the vernacular it is *Batavi nebu*, owing to its having been introduced from Batavia. Pickering[9] thinks that the shaddock is the fruit referred to occasionally by authors of early times, "when lemons as large as watermelons" were seen by Abd-Allatif, and which was described by Ebn-Ayyas as "an orange of extraordinary bigness."

The name shaddock is derived from a sea captain of that name, who first carried the seeds to the West Indies, where it was soon under successful cultivation.[10]

The fruit of the members of this genus is a form of the berry, and is distinguished botanically by the term *hesperidium;* in this case the epicarp and mesocarp form a separable rind, and the endocarp sends prolongations inward, forming triangular divisions, to the inner angle of which the seeds are attached, pulpy cells being developed around them.

The terms grape fruit and shaddock are interchangeable as applied to the fruit in the markets of the cities of the northern United States, depending principally upon the size of the fruit, which, if large, is termed shaddock. In the West Indies the name grape fruit is also applied to a similar fruit of the genus, which will be described later. No reliance can be placed upon common names of plants or flowers, as it is well known that different sections of the same country have identical names for distinct species, and *vice versa.* The term shaddock is the only one employed by the greater number of writers who mention the fruit, the synonym grape fruit being seldom noticed even in dictionaries and works of reference. The Century Dictionary contains a curious contradiction in its definitions of the two terms: Under the word shaddock it states that "the shaddock proper is generally inferior to its smaller variety, the grape fruit, or pomelo, which is further distinguished by bearing its fruit in clusters." Under grape fruit it is stated that "it is a large variety of the shaddock, called grape fruit in the northern cities of the United States, presumably from its grape-like flavor." This valuable work of reference also gives the following additional list of names applied to the fruit in various localities: *Pumpelmoes*, *pampelmoose*, *pompel-*

---

[9] 1879, Chas. Pickering, *Chronological History of Plants.*

[10] 1828, Rees' *Encyclopedia;* 1837, Jas. Macfayden, *Flora of Jamaica;* 1866, Loudon's *Encyclopedia of Plants;* 1879, Chas. Pickering, *Chronological History of Plants.*

moes, pompoleon, pompelo, pomelo, pumelo and *pummelo.* Many fruit dealers and importers of tropical fruit were interrogated regarding the matter; the majority of them stated that there was no difference between the grape fruit and shaddock excepting that of size.

There is a similar fruit which is claimed to be specifically different and which is frequently confused with the shaddock by botanical authorities. This is the Adam's apple, or forbidden fruit, known also by the names Paradise apple, pomo di Paradiso, pomo d'Adamo and Malum Assyriaca.[11]

This confusion was doubtless caused by Rumphius and Linnæus, who included it in their descriptions of the shaddock.[12] The most comprehensive study which was ever made and published regarding this subject was that of Jas. Macfayden,[13] who spent some years in the island of Jamaica, where the trees had been cultivated for a number of years previously. He differentiated the two species and applied the specific name *Paridisi* to the forbidden fruit. The following comparison of the characteristics of these two trees has been made, from his observations regarding them, in a manner which enables the reader to appreciate the differences at a glance:

SHADDOCK.	FORBIDDEN FRUIT.
Citrus decumana.	*Citrus Paradisi.*
Tree 12 to 18 feet in height, with a flat crown and spreading branches, seldom spiny.	Tree about 30 feet high; branches sub-erect, spiny; spines short axillary.
Leaves alternate, elliptic, rounded at both ends, sub-emarginate, crenulated, glabrous above, puberulous beneath, pellucid-punctate. Petioles winged, wings crenulated and minutely ciliate.	Leaves oval, rounded, crenulate, glabrous; petioles winged.

[11] 1591, D. Jacobi Theodor Tabernac, *Kreuterbuch;* 1597, Gerarde's *Herbal;* 1858, Robert Hogg, *The Vegetable Kingdom and Its Products;* 1885, Hehn and Stallybras, *The Wanderings of Plants and Animals;* 1823, Risso, *Essai sur l'histoire naturelle des Oranges, Bigaradiers.*

[12] 1763, Linnæus, *Species Plantarum;* 1824, De Candolle, *Prodromus Systematis Naturalis Regni Vegetabilis,* I-539; 1858, Robert Hogg, *The Vegetable Kingdom and Its Products;* 1879, Chas. Pickering, *Chronological History of Plants.*

[13] 1837 Jas. Macfayden, *Flora of Jamaica.*

Flowers appear from February to May, and are dispersed in subterminal racemes, 3 to 9 flowered; the flowers are furnished with lanceolate bracts at point of insertion. Peduncles angular, pedicels pubescent.	Flowers peduncled, axillary, either solitary or in a raceme. From 2 to 6 bracts at the base of each pedicel. Peduncles glabrous, ½ inch long.
Calyx irregularly 4-fid (rarely 5-fid).	Calyx irregular, 5-fid, faintly ciliate.
Petals 4 (sometimes 5), oblong-obtuse, coriaceous, externally viridopunctate, furrowed longitudinally internally.	Petals 4, linear-oblong, rounded.
Stamens 30–35.	Stamens 25.
Ovary stipitate, globose, green and minutely pubescent.	
Style terete and club-shaped.	
Stigma subcapitate, turbinated.	
Fruit very large with a thick rind.	Fruit sweetish, sub-acid.
Two varieties known.	Two varieties known.
Var. α. Maliformis. Fruit globose, pale pink pulp.	Var. α. Maliformis, called forbidden fruit.
Var. β. Pyriformis. Fruit pear-shaped, pulp crimson.	Var. β. Pyriformis, called Barbadoes grape fruit.
The second variety is more esteemed, being sweet and juicy, and having only in a slight and palatable degree the acridity which abounds in the first.	As is the case with the shaddock, the pear-shaped variety possesses most of the sweet principle, and is a preferable fruit.

That a difference does exist is evident from the above comparison. Mr. Macfayden applied the term grape fruit to the pear-shaped variety, and called the globose variety forbidden fruit. These terms may since have become interchanged, for the observations of a gentleman who spent some time in the West Indies show that at the present time the pear-shaped variety is called forbidden fruit, which was substantiated by several importers of tropical fruit, who also stated that the forbidden fruit is only in demand during the holidays, when it is used in fruit displays on account of its attractive appearance. Mr. Macfayden also observed that the trees in Jamaica are of an inferior character, from the fact of their having been raised from the seed, with no subsequent efforts to improve the quality by budding or grafting, a fact which had been mentioned some years previously by Thomas Martyn.[14]

The following descriptions of these fruits were furnished by a gentleman who had spent some time in the West Indies, and are

[14] 1797, Thomas Martyn, *The Gardener's and Botanist's Dictionary.*

interesting from the fact that they practically corroborate Mr. Macfayden's observations, made some fifty years before.

"Shaddock (*Citrus decumana*). This tree bears the largest fruit of the Citrus tribe. It grows to about the same height as the lemon or orange trees, with similar leaves, which are downy on the under surface. The flowers are larger than the orange blossoms, though similar. The fruit is of the shape of a huge orange, measuring 8 to 12 inches in diameter (large ones weigh from 7 to 8 pounds), and is covered with a pithy rind from ¾ to 1 inch in thickness. The membrane that surrounds each 'fig' of the pulpy interior is very bitter, and is much thicker than is the case with the orange. It is customary to carefully avoid this when eating the fruit. As compared with the orange, the fruit is less juicy; a marked difference also exists in the flavor. Two varieties, having respectively red and white pulp, are known. There is little perceptible difference between them in flavor, the red is the sweeter, the white the more juicy of the two. The peel is candied and is in great demand among the inhabitants of the West Indies. This fruit should not be confounded with either the grape fruit or forbidden fruit."

"Grape fruit and forbidden fruit. These two trees of the Citrus family are so closely allied as not to be distinguishable in leaf or flower. The fruits are similar in the color of the pulp, which is pale yellowish. The grape fruit looks like a double-sized orange with a lemon-colored rind, while the forbidden fruit, of about the same size and color, is pointed at one end. The flavor of these two fruits is different from that of the orange, and, while they closely resemble each other, the forbidden fruit seems to have more of the shaddock flavor than the grape fruit, which is the more juicy. The rind of the grape fruit is thinner than that of the forbidden fruit, and, while hardly much thicker than the rind of an orange, it is tougher and stronger. These fruits are grown in the West Indies in much less quantity than oranges, but, while not sought after to any great extent for export, command a much larger price proportionately in the local markets. The skin surrounding the segments of the fruit is bitter, as in the case of the shaddock. While the shaddock, grape fruit and forbidden fruit are not equal to the Florida orange in richness of flavor, they are preferred to the West India orange, which is extremely acid."

The first mention of the shaddock is antedated many years by references to the forbidden fruit, which was fully described in many early works on plants, before the science of botany had evolved itself from the great mass of independent facts collected by early observers. Several very old references were found,[15] one of which is here quoted verbatim, with some correction of the antiquated spelling.

---

[15] 1591, D. Jacobi Theodor Tabernac, *Kreuterbuch*; 1597, Gerarde's *Herbal;* 1640, John Parkinson, *The Theatre of Plants*, quoted above.

"Malum Assyria vel Pomo Adami. This tree groweth for the most part as great as the orange tree, yet sometimes it is no higher than the citron tree, and spreadeth fair great arms and branches, with few, and those short, thorns upon them. The leaves are fair and large, almost as great as those of the citron or lemon tree, pounced with holes in like manner. The flowers also are not much unlike, but the fruit that followeth is more like unto an orange, yet two or three times bigger, pale yellow rinded, thick, rugged and uneven, and with some rifts or chaps thereon, as if it had been bitten, from whence was obtruded that fond opinion unto the vulgar (for wise men would be ashamed of so ridiculous an opinion), that it was the fruit which Adam tasted in Paradise, and that, therefore, the marks should remain upon the whole kind forever after; thus have we three or four trees foisted into men's conceits by irreligious cozeners for Adam's apple. A spongy substance is next the skin of the fruit, which hath an acid sweet juice, yet not so pleasant as the others, and it hath round seeds among it like the citron."

The forbidden fruit is said to be used by the Jews of all countries at their feast of the tabernacles, and in many parts of Italy it was cultivated solely for that purpose.[16]

The shaddock undoubtedly has more decidedly specific characteristics than some others of the Citrus family,[17] some botanists even going so far as to declare that the only distinct species in the genus are the shaddock, on one hand, and all the other members on the other.[18] Few persons, however, would be willing to believe in the identity of the orange and lemon considered specifically. The fruit, as has been remarked before, is larger than any other fruit of the genus. It is described by some authors as sometimes exceeding 15 pounds in weight.[19] Linnæus[20] alludes to its large size in the following expressive manner: "Malus aurantia fructu rotundo maximo pallescente caput humanum excedente."

At the present time, the shaddock is successfully cultivated in most sub-tropical countries; the demand for the fruit, while not large, is constant, and the tree is a very prolific bearer of fruit, so that it is a source of considerable profit to those persons who are directly interested in its cultivation. Two illustrations accompany this article, which are from photographs of fruit-bearing trees. The one of the entire tree shows the bearing-down of the branches

---

[16] 1885, Hehn and Stallybras, *The Wanderings of Plants and Animals.*

[17] 1880, Bentley and Trimen, *Medicinal Plants.*

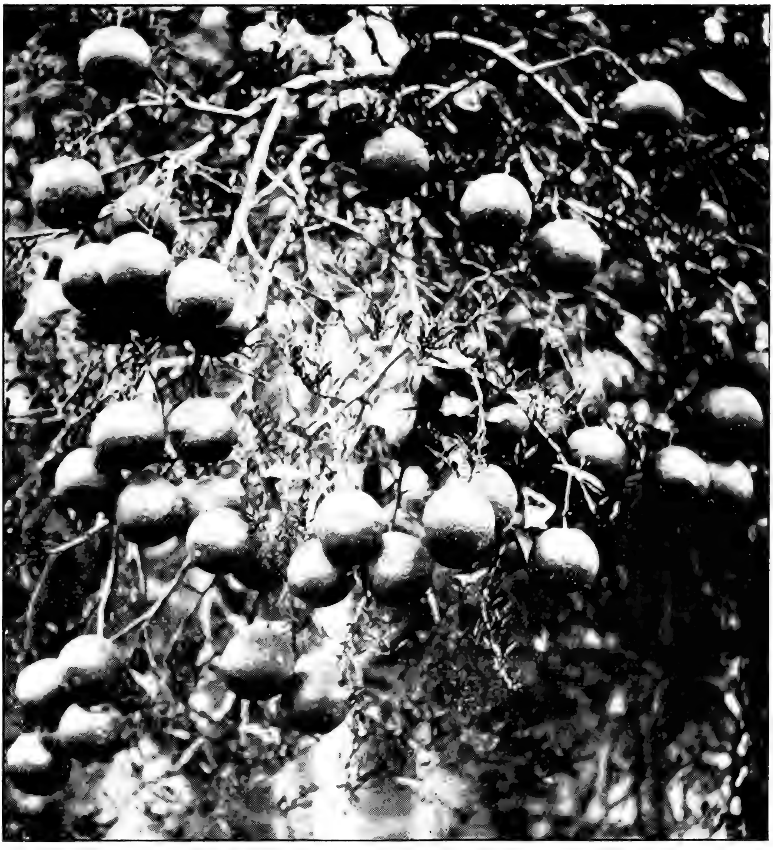
[18] 1838, John Lindley, *Flora Medica.*

[19] 1891, Baron von Mueller, *Select Extra-Tropical Plants.*

[20] 1763, Linnæus, *Species Plantarum.*

on all sides from the heavy load of fruit. The illustration of the fruiting branch is a very good example of the manner in which the individual branches are sometimes crowded.

The liking for the fruit is an acquired one, in the majority of cases, as the impression usually formed, when the fruit is tasted for the first time, is that it resembles a poorly flavored orange more than anything else. Those persons who have cultivated a liking for it are, in most cases, enthusiastic in their praises of it, and the prophylactic and curative properties attributed to it by some of its devotees would cause it to rival the famous elixir vitæ in efficacy. It is supposed to be especially beneficial in dyspepsia and stomach troubles, and it is probably on this account that the demand for the fruit is constantly increasing. A recent newspaper article, in commenting upon the inferiority and scarcity of this year's supply, referred to the consumers of the fruit as "people who had formed the grape fruit habit," and that the matter is a serious one, from the fact that "it requires a certain amount of strength of mind to get accustomed to eating the fruit without sugar, and to learn to appreciate the bitter, aromatic, tantalizing flavor of the perfect fruit. That stage once reached, one is exposed to the temptation of casting away medicine bottles and devoting one's self to the fruit instead." The supplies in the markets of the northern United States are derived from the West Indies and Florida, the fruit from the latter source being preferred by those who are supposed to be able to judge correctly of its quality. The importations are small, compared with other fruits from the same ports, but are steadily increasing. The late frosts in the spring of 1895, which affected such a large area of the fruit-growing districts in the South, were especially destructive to the shaddock trees, so that the Florida crop was almost entirely destroyed, and the few that reached the Northern markets were inferior to those of former years, and commanded a much higher price. Some very good specimens were obtained after some difficulty, and were examined for percentage of glucose, citric acid, etc. While in search of samples of the fruit for examination, the author was fortunate in obtaining one of extraordinary size. It had been packed into a box of oranges for the purpose of occupying space, and was looked upon as an imposition by the receiver, who parted with it for a fraction of the sum it would have brought at retail. This specimen was globose, pale yellow in color, with a



SINGLE BRANCH OF THE SHADDOCK TREE IN FRUIT.

SHADDOCK TREE IN FRUIT.

slightly roughened surface. The dimensions of the fruit are given below, as well as the results of the chemical examination:

Weight	3,118 grammes (6 lbs. 14 oz.)	
Greatest circumference	63 centimetres ($24\frac{3}{4}$ in.)	
Greatest diameter	22 centimetres ($8\frac{1}{2}$ in.)	
Weight of peel	907 grammes	29·08 per cent.
Weight of pulpy interior	2,211 grammes	70·92 per cent.
Juice	1,200 cubic centimetres.	
Specific gravity of juice	1·0319.	
Reducing sugar present	2·00 per cent.	

100 cubic centimetres of juice required 11·25 cubic centimetres normal KOH for neutralization, using phenolphthalein as indicator, corresponding to 0·787 per cent. of citric acid.

Agitation with ether removed a crystalline principle from the juice. The quantity present was very small (0·0165 per cent.), but enough was obtained to take the melting point, which was 230° C. A similar principle was obtained in small quantities from the peel by extracting with cold water, and shaking out the aqueous extract with ether; this substance was of the same appearance, and had the same melting point.

Subsequent examination of specimens of smaller fruit gave slightly different results. Two examples will suffice to show the difference, which was not great, except in regard to the acidity:

NO. 1.

Specific gravity of juice	1·0425
Reducing sugar present	3·57 per cent.

100 cubic centimetres juice required 27·75 cubic centimetres normal KOH, phenolphthalein, corresponding to 1·94 per cent. citric acid.

NO. 2.

Specific gravity of juice	1·040
Reducing sugar present	3·84 per cent.

100 cubic centimetres juice required 18·91 cubic centimetres normal KOH, phenolphthalein, corresponding to 1·32 per cent. citric acid.

These analyses show that the differences in individual specimens of this fruit are no greater than in any other fruit which varies in quality of flavor and degree of acidity. The large specimen, which contained less sugar and acid, was a fruit of inferior flavor, which is not an uncommon occurrence in very large fruits of any species.

A syrup was made by using the juice and peel in the same manner as in the preparation of syrup of lemon. It was of an agreeable aromatic flavor, agreeably acid, with a not unpleasant bitter after-taste.

In summing up the various differences between these closely allied fruits, the author wishes to state the fact, mentioned previously, that common names are uncertain designations to go by. The literature herein submitted is contradictory in many respects. In the ancient descriptions of forbidden fruit no mention was found of a pear-shaped fruit, while that is a distinguishing character of that fruit as described at the present time. The term grape fruit was formerly used to denote a fruit of entirely different appearance, while now, it seems, from the testimony of persons whose observations were made on the spot, that it is a fruit closely resembling the shaddock in appearance, but still specifically different. The catalogues of several Southern nurserymen were consulted, with still more confusing effect. One described the grape fruit, or pomel, as Citrus pomelano, and offered two varieties. This same catalogue placed the forbidden fruit under the varieties of Citrus decumana, or shaddock. Another catalogue describes four or five varieties under the name Citrus pomelana (decumana). The extent to which hybridization is carried at the present time by fruit growers, who try to satisfy the popular craving for new varieties of old fruits (illustrated by the hundreds of varieties of apples now cultivated), makes gradations between species and varieties heretofore distinct, and renders classification almost impossible. The abundance of testimony is in favor of the grape fruit and shaddock being different varieties of the same species in the Northern markets; any difference which may exist is not noticed by the majority of persons who eat the fruit, and is apparently much slighter than is the case with the number of varieties of the orange with which we are familiar.

The author wishes to express his thanks to the following persons, who have been of service to him in his work upon this subject: Professor Trimble, for his many suggestions and valuable aid; Mr. Francis Lawton, of Jacksonville, Fla., for his descriptions of the fruit as known in the West Indies; and Miss Bertha L. De Graffe, for the photographs from which the illustrations accompanying the article were made.

A SUBSTITUTION FOR RHUS TOXICODENDRON.

By J. L. D. Morison.

Contribution from the Botanical Laboratory of the Philadelphia College of Pharmacy.

The leaves of the common Virginia creeper, Ampelopsis quinquefolia, Mich., are sometimes substituted for those of the official Rhus toxicodendron.

This observation was recently confirmed in the examination of a quantity of the drug which was purchased from one of the most reliable wholesale houses; and this fact emphasizes the necessity of making a careful examination of all drugs of this class for the purpose of establishing their identity, judging of their quality, or detecting adulterations and substitutions.

A fraud of this nature may be easily detected by soaking up a sample of the leaves in water and carefully examining them. Those of the poison ivy are pinnately compound with three leaflets, while those of the Virginia creeper are palmately compound with five leaflets. The individual leaflets of the two plants differ also in form. The terminal leaflet of the poison ivy is long-petiolate, ovate or oval in general outline, with an acuminate apex, a somewhat wedge-shaped base, and a nearly entire margin; the lateral leaflets are nearly sessile, obliquely ovate, pointed, unequal at the base, with a variously notched or toothed margin, and have short petioles of nearly equal length.

When collecting this drug, the two plants may be easily distinguished. Both have the climbing habit, the poison ivy being provided with numerous adventitious roots that project from the sides of the stem, while the Virginia creeper produces disk-bearing tendrils opposite the leaves. The flowers of both plants are small and inconspicuous. Those of the poison ivy are yellowish-white, forming slender axillary panicles, while those of the Virginia creeper are greenish and occur in cymose clusters.

There is also a marked difference in the appearance of the fruits, those of the former being yellowish and drupaceous, and those of the latter small, purplish berries covered with a delicate bloom. The foliage of each is a bright crimson in the autumn, the leaves of the Virginia creeper, however, being browner and assuming a more vivid hue.

Finally, the poison ivy, as its name indicates, possesses an acrid juice that is intensely irritating to the skin and mucous membranes. On the other hand, the Virginia creeper is harmless, and may be handled with impunity.

The botanical characters of these two plants are thus seen to be markedly different, and but little difficulty is presented in distinguishing them.

THE USE OF OXALIC ACID IN PRESERVING THE COLOR OF DRIED PLANTS.

By J. Henry Schroeder.

The importance of a well-selected herbarium is known to every botanist of the present day. It presents to him the most important specimens of the flora so far as known, and the better the specimens are preserved, the more valuable the collection. A very important, if not the most important, question is, how to preserve the natural color of the foliage, as well as the color of the petals.

No doubt, the rapidity with which the plant is dried greatly influences the preservation of the natural color; but in the course of time the great majority will fade, while others acquire different shades, some turn black, some brown and various other colors. This last change of color frequently takes place while the plant is bring dried, and more rarely later on.

Not only the leaves, but the petals of most flowers change in the same way, thus lowering the value of the specimen to a considerable extent.

Nienhaus published in the *Schweizerische Wochenschrift für Chemie und Pharmacie*[1] his experience with oxalic acid as a preserving agent of the color of petals of dried plants. His theory was that ammonia in the air caused the fading of the color, and that it would be neutralized by this acid; therefore, he recommended that the plant be dried between filter-paper, which had previously been saturated in a 1 per cent. solution of the chemical, and then dried. Nienhaus experimented with the petals of *Papaver Rhœas,* and was very successful. According to some American writers, who have repeated his experiments, the results were entirely negative.[2]

---

[1] *Monatsblatt des deutschen Apotheker Vereins von New York*, March, 1895 (B. I, 11).

[2] *Bulletin of Pharmacy*, June 1895, p. 269.

Since then I have had occasion to study the value of Nienhaus' process, and have found that not only the petals are well preserved, but that a 3 per cent. solution will also preserve the color of the leaves. In the hope that the results may be of interest to collectors of plants, I think it proper to bring it to their notice.

Several specimens, which had been dried by the aid of 1 per cent. oxalic acid, did not give me as good results as I had hoped to obtain, and I then determined to study the value of different strengths of the solution, and find out which would be most suitable to be employed in average cases.

For this purpose I saturated some gray felt paper with solution of oxalic acid, varying in strengths from 1 to 5 per cent., and dried.

Leaves of different texture were selected, dried between the thus prepared paper at ordinary temperature, changing paper once in twenty-four hours.

Leaves of a *thin* texture were well preserved with a 2 per cent. solution; not so well with that of 1 per cent. Those dried between 3 to 5 per cent. paper did not differ materially in appearance from those dried with that of 2 per cent. strength.

Leaves of a *thick* texture were best preserved with 3 per cent. of the acid, although the 4 and 5 per cent. solutions showed no disadvantage.

The leaves of aquatic plants were best preserved with 2 or 3 per cent. of acid; the 1 per cent. specimens turned dark, and with 4 or 5 per cent. they were almost black in one case, while in other aquatics I could observe no difference between any of the specimens; they all had kept well.

These results suggested to me that paper saturated with a 3 per cent. solution of oxalic acid might be used with more advantage for the majority of plants than a 1 per cent. solution, as recommended by Nienhaus. It is not unlikely that the kind of drying-paper used influences the results to some extent.

Nienhaus recommended filter-paper to be employed; in fact, the heavy felt paper mostly employed in this country is not often used in Germany for drying purposes; the botanists there prefer a very much thinner gray paper.

In almost all cases where a 3 per cent. solution of oxalic acid was employed, I have obtained satisfactory and encouraging results,

except with some members of the Umbelliferæ, which turned dark when thus treated.

I had not the opportunity of making further experiments with them, and do not know their behavior when dried in paper without the aid of oxalic acid.

The leaves of Phytolacca decandra, under ordinary circumstances, turned to a very dark color; when dried by the aid of a 3 per cent. solution of oxalic acid they remain green.

The leaves of Geranium maculatum commonly turn reddish-brown; when preserved with 3 per cent. of the acid they remain green.

The leaves and petals of Baptisia tinctoria almost invariably turn black when dried in the ordinary way; when preserved with 3 per cent. oxalic acid, the change is much less pronounced and the petals remain yellow.

In all specimens the color of the petals was unchanged.

The results which I have obtained by this process lead me to the conclusion that it may be employed with decided advantage in almost all cases, and I will briefly state the method I have employed: Heavy gray felt paper was thoroughly saturated with a 3 per cent. solution of oxalic acid, and dried. This, when done at ordinary summer temperature, required about twelve hours. Directly between the thus prepared paper I placed the plant; in case the petals were very delicate, they were protected by a very thin piece of paper to prevent imprints from the rough felt paper. The latter was changed once in twenty-four or thirty-six hours, until the plant was thoroughly dried, and it was then mounted in the ordinary way. If possible, the plants should be placed in the press at the time of collection, or carried in an air-tight box and moistened before pressing.

Up to the present date I have not had the opportunity of studying by experiments to what extent plant colors are really injured by ammonia, but I hope to be able to report upon this question at a subsequent date.

PHILADELPHIA, February, 1896.

BITTERLESS CASCARA SAGRADA.

By Henry B. Gilpin.

The extended use of Rhamnus Purshiana, or Cascara Sagrada, as it is more usually termed, has led to frequent attempts to improve the various pharmaceutical preparations of this valuable drug. The researches of various investigators have proved that the laxative properties of the bark are undoubtedly due to principles similar in their medical properties, and, to a considerable extent, in their chemical composition, to those contained in rhubarb and frangula. Cascara Sagrada differs materially, however, from rhubarb on account of the presence of a bitter, crystalline principle. Meier and Webber assert that the drug also contains a ferment, to which is attributed the griping effects of the fresh bark, and there is little doubt that our Pharmacopœia should insert in its definition a requirement that the bark should be kept at least one year after its collection before being used, as is the case with the definition of frangula bark. The bitter principle has been regarded by many as objectionable, and as interfering with the continued use of the drug as a laxative. The resinous constituents are, without doubt, the cause of the purgative action. The pharmaceutical problem which is presented, then, is to provide a preparation which will contain all the resinous constituents, but free from bitterness; and with this object in view, a process has been devised for making a powder which may be used for the liquid preparations, such as fluid extract, tincture, syrup, etc.

BITTERLESS POWDERED CASCARA SAGRADA.

	Grammes.
Take of powdered Cascara Sagrada	500
" licorice root	110
Magnesia (calcined)	10
Powdered cloves	5

The powders are thoroughly mixed, transferred to a "power kneader," and then moistened with sufficient water; after being thoroughly kneaded, the mass is transferred to a closed drying chamber, and subjected to a uniform temperature of 180° F. for forty-eight hours. The moisture is then permitted to escape from the chamber, and the powder thoroughly dried, after which it is repowdered and sifted.

It will be observed that aromatics are added with a view to improving the taste, and the preparations made from the powder are free from bitterness, whilst the laxative properties are unimpaired.

Baltimore, February 12, 1896.

A CONTRIBUTION TO THE KNOWLEDGE OF SOME NORTH AMERICAN CONIFERÆ.

By Edson S. Bastin and Henry Trimble.

(*Continued from page 79.*)

PINUS PALUSTRIS.

CHEMICAL COMPOSITION.

For the purpose of investigating the constituents, other than the oleoresin, of Pinus palustris, two specimens were obtained; one, consisting of young shoots, was procured in Philadelphia, just before the holiday season, when considerable quantities of the tops of young long-leafed pines are brought from North Carolina and sold in Northern cities. The present sample was probably collected in December, as it was quite "green" when received. The bark and leaves of this specimen were investigated. The other sample was obtained from Dr. Charles Mohr, of Mobile, Ala., and was also collected in December. It was taken from trees of medium size and age, and consisted largely of cork. The following are the percentage results for moisture, ash and tannin:

	Moisture.	Ash in Absolutely Dry Material.	Tannin in Air-Dry Material.	Tannin in Absolutely Dry Material.
Leaves of young tree . . .	4·92	1·91	7·54	7·93
Stem bark of young tree .	7·46	1·34	17·49	18·89
Trunk bark of old tree . .	10·62	0·80	5·04	5·64

The tannin in all cases gave a green color and precipitate with ferric chloride, a yellow precipitate with bromine water and a purplish precipitate with lime water, thus indicating its similarity to those already studied in this natural order.

The leaves readily yielded their green coloring matter to absolute alcohol, to which solvent they also imparted an acid reaction similar to that obtained from the leaves of the other species examined.

Mucilage was present in both leaves and bark, but in relatively small proportion.

The ash, in all cases, was composed chiefly of calcium phosphate with some sulphate and carbonate.

The oleoresin is by far the most important constituent of the long-leaf pine. According to H. Mayr[1], the sap wood yielded 2·65, and the heart wood 11·09 per cent. of resin, and he ventured the

[1] *Das Harz der Nadelhölzer*, Berlin, 1894.

statement that no German, and, apparently, no other American pine, contained as much resin.

No attempt has been made in the present case to investigate the chemistry of this oleoresin, although such a work is sadly needed. Some progress on this subject was recorded by R. G. Dunwody[2], who also described the turpentine industry. J. H. Long[3] has added considerable to our knowledge of the physical constants of turpentine oil. He has pointed out the fact that no attempt is made by turpentine producers to keep the products from different species of pine separate, which, no doubt, accounts for the variable results obtained by different investigators in pine oils. This, Professor Long[4] has more recently (1894) kept in mind in a further contribution, in which the oil was distilled from the products of single trees. The results are more uniform and satisfactory. Research is still needed on all the products from the Pinus palustris, since it furnishes the largest proportion of the world's supply of resin and its products.

The subject of resinous products and the turpentine industry will be considered later, after the other pines which furnish the balance of the supply, have been considered.

It may be appropriate to consider at this point

THE PHYSIOLOGY OF THE RESINS,

since these compounds are most abundant in the long-leaf pine. As long ago as 1867, Hlasiwetz[5] pointed out the relation between the decomposition products of the resins and the tannins.

It is pertinent to note in this connection that all the facts observed regarding the oleoresins of the pines show that they are very closely associated with the tannins. While this, of itself, does not prove that the former are derived from the latter, the nature of the association is such as to strongly suggest such a conclusion. For example, a secretion reservoir begins in a cluster of a few thin-walled cells, rich in granular protoplasm, which early shows an abundance of tannin. Later on, oleoresinous matters appear, and, as these increase in quantity, the tannin and the protoplasm dimin-

[2] Am. Jour. Phar., 1890 p. 284.

[3] *Journal of Analytical and Applied Chemistry*, **6**, 1 and **7**, 99.

[4] *Journal of the American Chemical Society*, **16**, 844.

[5] Ueber die Beziehung der Gerbsäuren, Glucoside, Phlobaphene und Harze, *Sitzb. d. mathem.-naturw. Cl.*, **55**, (II) 575, *Annalen*, **143**, 290.

ish, and finally the walls break down, leaving a cavity or intercellular space containing the oleoresin. In the meantime, cells immediately bounding this space are gradually undergoing similar changes, and so on, as long as the secretion reservoir continues to grow. So, if any well-developed secretion reservoir, with the surrounding cells, be examined, there will be found: (1) a central space filled with oleoresin; (2) an area of cells immediately surrounding this, which contain much oleoresin, and little tannin and protoplasm; and (3) still farther exterior, a layer of very granular cells, rich in protoplasm and tannin, but containing very little volatile oil or resin. In Pinus palustris, a species especially rich in oleoresin, it is also clearly seen that the older medullary ray cells of the wood are filled with oleoresin, but contain but little tannin, while the reverse is the case with the younger medullary ray cells. There is no denying the fact that, as the resin increases, the tannin diminishes, whatever the conclusion we may draw from the circumstance.

The view that tannic matters are derived from starch apparently obtains no support from these observations on the pines. A very little fine-grained starch was found in the stems of the pines investigated; it was never abundant, while in the roots it was usually present in considerable quantity. On the other hand, as respects the tannin of the different species, very little difference was observed between the roots and stems, either as to the quantity or as to the distribution of the tannin. No indication whatever was found that as starch decreases tannin increases, or of any quantitative relation between the two substances. The facts do, however, show an intimate relation between the tannin and the protoplasm. It is abundant in all parts of the protoplasm, even in the nucleus, though it does not appear to exist, normally at least, except in very minute quantity, in the cell wall. After the death of the tissues, however, it rapidly diffuses into the cell walls. Tannin was found even in the protoplasm of meristem cells, though apparently in less abundance than in many of the more mature cells. In the living cell it seems to be most abundant in the ectoplasm. While this does not positively disprove that tannin is derived from a carbohydrate, the probability is at least suggested that it is derived from the breaking down of the proteids during the processes of cell growth. The process is probably complex, but no guess is ventured as to what the various chemical stages of the process are.

The investigation has thus far thrown little or no light on the question of the functions of tannin, whether it is physiologically useful or whether it is to be regarded as wholly a waste product of tissue metamorphosis.

As respects the origin of resin from volatile oil, the microscopic study of the pines, especially of P. palustris, seems to afford pretty clear evidence.

Old secretion reservoirs were observed to contain irregular solid or semi-solid masses of oleoresin, in which apparently the resin is the predominating element, while young reservoirs contain a more fluid oleoresin in the form of globules. Moreover, in the secretion cells immediately surrounding the reservoirs the oleoresin is in globules and evidently very fluid. In fact, in passing from the younger to the older portions of the secretion tissue there appears to be every gradation between a very liquid volatile oil and a semi-solid oleoresin.

There appears to be no question that the oleoresin is to be regarded as wholly a waste product. It clearly can play no part in the process of nutrition. Its only use is that of protection against the destructive forms of animal life and against vegetable parasites.

It is highly antiseptic, it protects mechanically against injurious insects, and its taste and effects are disagreeable to most of the higher animals.

PINUS LONGIFOLIA, ROXB.

EMODI PINE, CHEER PINE.

Through the courtesy of Mr. A. E. Wild, conservator of forests, Bengal, India, we have been able to examine the tannin percentage and its character in a number of coniferous barks from that section. This one is introduced here on account of its close relation to our own P. palustris.

For the history, description, etc., of P. longifolia, we are indebted to the Pharmacographia Indica, Part VI, and to the ninth edition of Mueller's Select Extra-Tropical Plants, just received.

The Cheer or Chir pine is a tall, handsome tree, with a straight, branchless trunk for 50 feet, the whole tree attaining a maximum height of 100 feet, with a stem girth of 12 feet. It is indigenous to Afghanistan and the Northwest Himalayas. The turpentine yielded by this tree is much prized by the natives. Incisions are made in the sap wood, and from 10 to 20 pounds of a good quality of turpentine are obtained the first year; about one-third that amount is collected the second year, after which the tree either dies or is blown down.

As with our native long-leaf pine, the resin is the most important con-

stituent; 56 pounds of the crude material, when distilled with water, yield 8 pounds of a colorless limpid oil. This oil, according to Lyon, has a specific gravity of 0·875 at 28° C., boils at 155° C., and is dextrorotary.

The sample of bark obtained by us yielded the following results for tannin and ash:

	Per Cent.
Moisture	11·75
Ash in absolutely dry bark	2·33
Tannin in absolutely dry bark	14·62

This tannin gave all the qualitative reactions indicating its identity with that from oak bark, and on combustion it yielded the following percentages:

	Per Cent.
Carbon	62·50
Hydrogen	5·28

These figures are a little higher than those yielded by oak bark tannin, but the small amount of material at our disposal prevented our purifying it to quite the extent we desired.

The bark of this tree is used by the natives for tanning, the branches are used for torches, and the resinous wood, besides yielding turpentine, is valuable for building purposes.

(*To be continued.*)

ARISTOLOCHIA ARGENTINA.[1]

By Dr. O. Hesse.

The principles isolated from different species of Aristolochia have received various names by investigators, although, no doubt, identical in some instances. Walz[2] gave to the resinous products from Aristolochia clematis the names aristolochic acid ($C_{11}H_{16}O_3$) and clematitin ($C_9H_{10}O_6$). The latter is thought to be identical with serpentarin or aristolochin, the poisonous principle obtained by Chevallier[3] from the root of aristolochia serpentaria. Frickinger[4] obtained from the young underground shoots of Aristolochia clematis a crystalline substance which he named aristolochia yellow, but its individuality was not established. Not long ago, Dymock and Warden[5] obtained from Aristolochia indica a resin of a basic nature. Later, Hesse published his, then, incomplete investigation of Aristolochia argentina[6] showing the presence of an ester, probably palmityl phytostearin, an alkaloid—aristolochine—and a yellow crystalline body

[1] Abstracted from translation in *Pharmaceutical Journal*, January, 1896.

[2] *Jahrb. f. prakt. Pharm.*, xxiv, 65; xxvi, 65.

[3] *Journ. Pharm.*, 2, v, 565.

[4] *Repert. für Pharm.*, 3, 7, 1.

[5] *Pharm. Journ.*, 3, xxii, 245.

[6] *Ibid.*, 3, xxii, 551.

—aristin. Previously, however, Pohl had investigated various species of Aristolochia, and described a finely crystalline yellow substance under the name of aristolochine. But as this substance is of an acid nature, it is thought better to call it aristolochic acid, so as not to confuse it with the alkaloid.

Hesse has since continued his investigations, and thereby made clearer the chemistry of these substances.

Aristolochine.—This principle is obtained by treating the roots with soda and afterward extracting with alcohol. The residue left after distilling off the alcohol is treated with sodium carbonate and ether, and, on shaking the ethereal solution with dilute tartaric acid and decolorizing with charcoal, the base is precipitated on the addition of ammonia and separated with ether. It is a colorless, distinctly crystalline substance. In alcoholic solution it turns litmus paper blue and completely neutralizes acids, but the salts are amorphous.

Indifferent Substance.—When atmospheric air containing ammonia is passed through an ether extract of the crushed roots, the liquid deposits red crystals. Afterwards the ether is shaken with acid, and, on distillation, a residue remains which yields crystals of palmityl phytostearin, $C_{42}H_{74}O_2$, melting at 82° C., and a minute quantity of aristolin, $C_{15}H_{28}O_3$.

Aristinic Acid ($C_{18}H_{13}NO_7$).—The red deposit from the ammoniacal extract consists principally of the ammonia salt of this acid. It forms greenish-yellow laminæ and needles, melting at 275° C., with decomposition.

Aristidinic Acid ($C_{18}H_{13}NO_7$).—This acid remains in the acetic acid solution from which aristinic acid has been separated. It is soluble in ether and crystallizes in small needles.

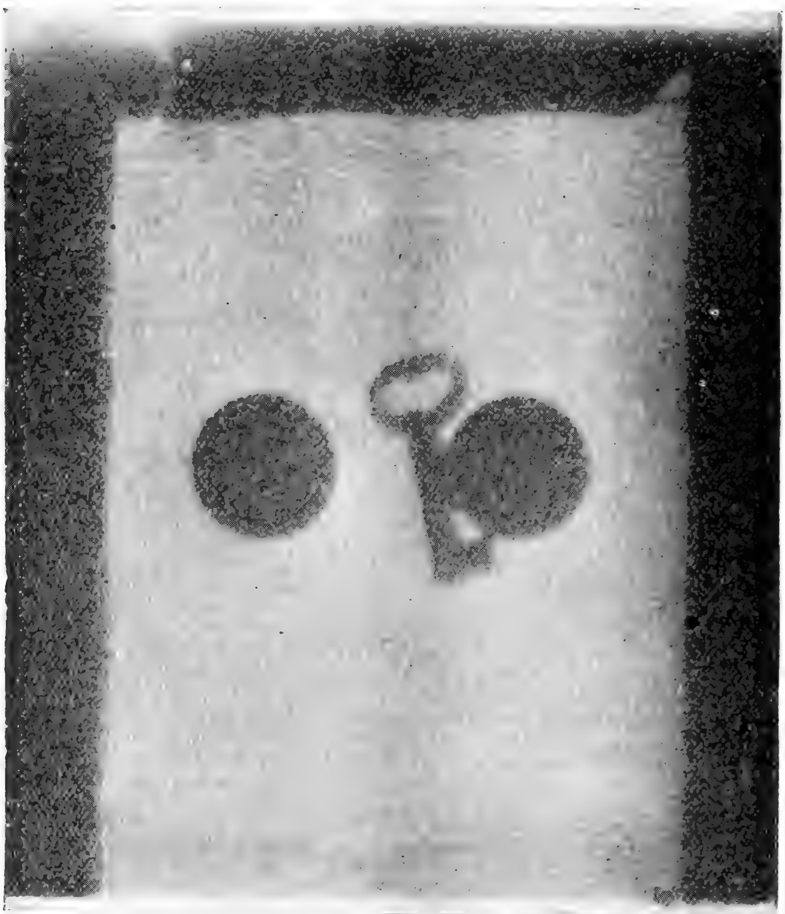
Aristolic Acid ($C_{15}H_{13}NO_7$ or $C_{15}H_{11}NO_7$).—On treating the alkaline solution from which the acids previously mentioned have been separated with hydrochloric acid, and afterward shaking with ether, an orange-yellow crystalline residue is obtained on evaporating the solvent. The crystals melt between 260° and 270° C. This acid dissolves in strong sulphuric acid with dark green color, this character indicating relation to the other acids and also to the aristolochine of Pohl.

These substances probably exist in other varieties of the genus Aristolochia, but an examination of the roots of Aristolochia longa has yielded only negative results.

ARE THEY ROENTGEN RAYS?

By Edson S. Bastin.

Years ago, when the writer dabbled somewhat in amateur photography, he observed that, when his plate-holders containing dry plates were exposed to direct sunlight, fogging was the result. It



Photograph by direct sunlight through Opaque Slide of Plate-Holder.

was then supposed that the plate holders must have been defective; but since the discovery of the new rays by Roentgen, it occurred to the writer that the effects observed may have been due to these rays in the sunlight; so it was determined to subject the matter to

the test of experiment. Accordingly, the plate-holder of a Corona camera, whose slides are of hard rubber, and another holder having a pasteboard slide, were taken for experiments. In one experiment, two copper pennies and a small brass key were fastened to the surface of one of the slides, beneath which was placed an ordinary dry plate, one of Seeds'. The margin of the plate-holder was covered with black paper, to guard against possible fogging by leakage of light, and the holder was exposed for two hours to direct sunlight. On development, there was a very distinct shadow picture of the pennies and key.

Further experiments showed that similar shadow pictures could be taken through two thicknesses of ordinary pasteboard, and through sheets of vulcanized rubber, 1 millimetre in thickness, but opaque to the eye. This was accomplished by means of gas and kerosene light, as well as by sunlight, though, of course, in these cases longer exposure was required than when direct sunlight was employed. Various experiments, however, showed that the rays did not agree in their properties with the X-rays of Roentgen. They can be reflected and refracted, and they penetrate only with the greatest difficulty a sheet of black paper. They are probably only the ordinary actinic rays, which have a power, heretofore unsuspected, of penetrating certain substances opaque to the visual rays. The facts, however, are of great practical importance to manufacturers and dealers in dry plates and to those engaged in the photographic art generally.

PHILADELPHIA, February 22, 1896.

THE GLACIAL ACETIC ACID TEST FOR GURJUN BALSAM IN BALSAM COPAIBA.

BY LYMAN F. KEBLER.

In the August number of this[1] JOURNAL, I reported on the efficacy of the above test. The test, as outlined there, is a modification of the original one. In the original[2] test, the balsam copaiba is dissolved in the glacial acetic acid and the nitric acid then added to the mixture, while, in the modification, the nitric acid is mixed with the glacial acetic acid, and the balsam carefully added to this mix-

[1] 1895, AM. JOUR. PHARM., 67, 394.

[2] 1895, *Am. Druggist*, 27, 5.

ture. I also take note of the zone of contact; this renders the modification test more delicate than the original. This note is presented here because it is maintained that the test as modified is too delicate. Thus far I have failed to secure a genuine sample of balsam copaiba that responded affirmatively with this test. I requested the party who informed me concerning the shortcoming of the modified test to forward me a sample of the genuine balsam copaiba with which this test indicated gurjun balsam. Thus far I have not received it, and probably never will. Any reader meeting with such a sample of balsam copaiba will do me a great favor by sending a portion to me.

305 CHERRY STREET, PHILADELPHIA.

THE MANUFACTURE OF ACETONE AND OF ACETONE-CHLOROFORM FROM ACETIC ACID.

BY EDWARD R. SQUIBB, M.D.,[1] of Brooklyn, N. Y.

Just one year ago, January 11, 1895, the writer read a paper before this Society, upon "Improvement in the Manufacture of Acetone," and this paper was published in the *Journal* for March, 1895, at page 187.[2] The improvement claimed consisted in the use of acetic acid instead of acetates, and in the use of a rotary still for the decomposition. The results given were obtained from a model apparatus on a table.

During the year that has elapsed since that paper was read, a large rotary still, 12 feet in length by 2 feet in diameter, has been set up, and this has decomposed, in 126 hours, about 1,700 pounds of absolute acetic acid, giving about 90 per cent. of the theoretical yield of acetone, against about 80 per cent. in the small apparatus.

But the patentees of the processes for making acetone from acetates object to the use of this process and apparatus as being in conflict with their patents.

The acetone produced was converted into chloroform by the Watts (Siemerling) proportions of material, in an apparatus described by the writer in 1857 (*Ephemeris*, Vol. IV, No. 1, p. 71), and used

---

[1] Read before the N. Y. Section of The American Chemical Society, January 10, 1896. From Squibb's *Ephemeris*, Vol. IV, p. 1743.

[2] AM. JOUR. PHARM., 67, 144.

for many years in making chloroform from alcohol, and this is also objected to.

Under these circumstances, it seems necessary to find out what has been done in the past upon this important subject, and what may be the relations of past work to the present conditions, and in this it is hoped the Society may be interested.

ACETONE.

It is impossible to determine when or where acetone was first made and used.[3] According to the authority last given, after the time of Boerhaave, in 1732, "the body was but little investigated until 1805, when Trommsdorff stated that, on distilling acetate of potash or soda, a liquid was obtained which stands between alcohol and ether." In 1807 the Brothers Derosne, in Paris,[4] studied its properties; and, in 1809, Chenevix[5] demonstrated that this substance was obtained by the dry distillation of any one of the acetates.

The correct composition of acetone was first given by Liebig[6] and Dumas.[7]

Further investigations by Kane, 1838, and by Chancel, Williamson, Chiozza, Freund, Wanklyn, and others, still more definitely established the sources, character and properties of acetone, and gave it a definite chemical and economic position, so that its production or manufacture by the dry distillation of acetates was as well known as the production of alcohol by distillation from fermented sugars, as early as 1848, when Böttger refers to it as a market article in common use. Wackenroder,[8] in 1848, states that since acetone is quoted on the price lists at 10 sgr. (Silbergroschen) per ounce, the preparation of chloroform from it is well worth recommending.

In "Handwörterbuch der reinen und angewandten Chemie herausgegeben von Dr. J. Liebig, Dr. J. C. Poggendorff und Dr. Fr.

---

[3] See Wurtz' Dictionnaire de Chimie, 1873, tome I, p. 31. Gmelin, Handbook of Chemistry, 1855, Vol. IX, p. 1. Roscoe and Schorlemmer, A Treatise on Chemistry, 1882, Vol. III, Part I, p. 568.

[4] Ann. de Chimie, t. LXIII, p. 267.

[5] Ann. der Physik, Vol. XXXII, p. 191.

[6] Ann. Pharm., Vol. I, p. 223.

[7] Ann. de Chim. et de Phys., t. XLIX, p. 208.

[8] Archiv. der Pharmacie, Vol. LIII, p. 273.

Wöhler—Redigirt von Dr. Hermann Kolbe, Braunschweig," 1842, Vol. II, p. 1018, is the following (translated) statement:

According to Justus Liebig and Pelouze, the best thing to use for the preparation of acetone is concentrated acetic acid, which in the state of vapor is conducted through a heated tube of glass, porcelain or iron, which, for the sake of increasing surface, is filled with pieces of charcoal, and the products of decomposition are condensed in the usual way. The tube should be heated only to incipient redness; at a higher temperature, only empyreumatic oils, combustible gases and charcoal are obtained as the products of the decomposition.

Besides the citations given, the literature on the preparation, properties and reactions of acetone is very copious and definite up to about 1853. After this date the papers published are comparatively few, leading to the inference that the substance had reached a definite position and gone into general use.

In a paper by Prof. Samuel P. Sadtler, Ph.D., "On Recent Improvements in the Methods for the Manufacture of Chloroform," published in THE AMERICAN JOURNAL OF PHARMACY for July, 1889, p. 321, the following statements are made:

"The old process of manufacture by the action of bleaching powder upon alcohol has given way to what is now termed the 'acetone' process. This is not, however, a new discovery. Liebig, in 1832, in following up his first account of the properties of the newly discovered 'chloride of carbon' (chloroform) mentions that it can be gotten in very large quantities by the action of bleaching powder upon 'pyroacetic spirit' (acetone) as well as from alcohol. That alcohol has, all this time, been preferred to acetone as a material from which to prepare chloroform is due mainly to the fact that only in recent years has acetone been prepared pure in quantity, but also to the erroneous statement of Siemerling, quoted in the works of reference, like Watts' Dictionary of Chemistry, that only 33 per cent. of chloroform could be gotten from acetone by the action of bleaching powder." . . . "The manufacture of a purer grade of acetone than that then in use for solvent purposes having been begun in Germany in 1881, on the part of the 'Verein für Chemische Industrie,' Liebig's old suggestion for the manufacture of chloroform from acetone was taken up by the 'Verein Chemischer Fabriken,' Mannheim, Germany, in the beginning of 1882, and a

year later by the first-mentioned company, which made the acetone for both."

From these references it will be seen that the reactions involved in the production of acetone, and the constitution, character, properties and reactions of acetone, had been long and well known prior to 1848, and that it had been made and utilized on a large scale prior to 1882; and further, that it had been produced both by the dry distillation of acetates and by the wet distillation of acetic acid, as a matter of open knowledge and practice.

This condition of the scientific knowledge of an important chemical substance throughout France and Germany—and throughout the scientific world—makes it very certain that the chemical industries, which depend upon such knowledge for their origin and progress in general, but do not publish their processes—availed themselves of this knowledge and of this chemical agent.

In June, of 1886, application was filed in the U. S. Patent Office, and two years later, in July, 1888, Letters-Patent, No. 385,777, were issued to Gustav Rumpf, for the invention of "a new and useful Improvement in the Manufacture of Acetone," and from the specifications and claims of this patent the following extracts are made:

"In making acetone by dry distillation of acetates—as acetate of lime—it has, before my invention, been thought possible to obtain only less than half the acetone.

"Dr. Hermann Hager, in his Handbuch der Pharmaceutischen Praxis, published in Berlin in 1882, states, under the head of 'Acetone,' 'that it is possible to obtain an average yield from chemically pure acetate of lime, only 15 per cent. of acetone, while the theoretical yield from chemically pure acetate of lime is 34 per cent.

"I have discovered that if the acetates are subjected for distillation to a low heat and approximately uniform temperature, and the process extended over several hours, the yield of acetone will be greatly increased, and will approach very nearly the theoretical yield of any particular acetate, which, in the case of good gray or commercial acetate of lime, is about 27 per cent. I have also discovered that in the process of subjecting acetates in a closed vessel to heat applied externally to the vessel for distilling acetone from the acetates, the desired slowness of distillation and uniformity of temperature may be secured by stirring the acetates so that all por-

tions of the mass will be subjected to the heat resulting from direct contact with the bottom of the vessel, and by admitting free steam from time to time into direct contact with the acetates in case of any undesirable rise in temperature within the vessel.

"My invention consists in an improvement in the method of obtaining acetone from acetates by destructive distillation, consisting in subjecting the acetates in a closed vessel to slow destructive distillation at a low and approximately uniform temperature, and it is also well to stir the acetates during such distillation."

The claims are to—

"The improvement in the method of obtaining acetone from an acetate, consisting in subjecting the acetate in a closed vessel to slow destructive distillation at a low and approximately uniform temperature."

This first broad claim is based, not upon the chemical reaction, which was well known, nor upon the destructive distillation by heat, which was a well-known process, but upon an improvement in the apparatus and management, by which the yield of acetone was alleged to have been increased. But the evidence upon which the increase is claimed is an erroneous statement quoted from Hager—erroneous because it is hardly practicable, through any ordinary degree of want of knowledge and skill, to obtain so little as 15 per cent. of acetone from acetate of lime.

The second claim is to a stirrer in its effects on the process. But a stirrer is a device so common in chemical processes that no such application of it can be considered original or new.

The third claim to the effect of the introduction of steam during the distillation is much better.

The fifth, sixth, seventh and eighth claims are to improvement in the process of purifying the crude acetone by means of lime, dilution and rectification, and these are but the steps common to all such operations.

It is upon this patent that infringement is charged, when it is simply putting into use the very old process of making acetone by the destructive distillation of acetic acid in a rotary still, as described in a paper on "Improvement in the Manufacture of Acetone," read before this New York Section of The American Chemical Society, on January 11, 1895, and published in *The Journal of the American Chemical Society* for March, 1895, p. 187, and in *An Ephemeris of*

Materia Medica, Pharmacy, Therapeutics and Collateral Information, Vol. IV, No. 3, p. 1653.

The writer makes acetone by the destructive distillation of the watery vapor of acetic acid in a rotary still, in the presence of barium carbonate, or pumice-stone, or bone-charcoal, barium carbonate being preferred because, being a very heavy powder, a larger charge of smaller volume can be used.

The patentees claim only acetates as their material, but claim infringement by the use of acetic acid, because acetic acid is made from acetates, and acetates are made from acetic acid ; and, secondly, claim infringement on the ground that acetate of barium is first formed, and then decomposed in the rotary still, and, therefore, the process is really not a destructive distillation of acetic acid, but of barium acetate—one of the class of acetates claimed as secured to them by their patent, although in use for this purpose for so many years. That is, it is claimed that an acetate of barium is formed under conditions of temperature in which an acetate of barium cannot exist. Barium acetate decomposes at about 400° to 405° C. by an ordinary pyrometer. Acetic acid is best decomposed at about 500° to 525° C. by the same pyrometer, and yet it is claimed that, at 500° C., barium acetate forms momentarily and then is instantly decomposed. That is, it is formed in an atmosphere in which it cannot exist for an instant, and in which acetic acid cannot exist.[9]

---

[9] Upon this point the patentees were very decided in the statement, based not only on their own experience, but also on the experience of their German correspondents, that, if the barium carbonate was replaced by pumice-stone, the amount of acetone obtained would be too small to have any commercial importance. This result had been confirmed to them by so many trials that, at their suggestion, and in order to satisfy them that their results were not trustworthy, the following experiments were made after the above paper was written, but before it was published.

The large rotary still was emptied and cleaned out by sweeping, scraping and finally by sponging with water until it was quite free from any appreciable quantity of barium salt. It was then closed and run empty with a continuous feed of acetic acid for periods of three hours each, at the following temperatures, the rate of feeding and the assaying for acid and acetone being approximate only, and only trustworthy by averaging:

At 300° C. 22·3 pounds of absolute acid was run in, and
19·5 " " " " " received without any acetone or any evidence of decomposition of the acid, the 2·8 pounds of acid not accounted for being the normal charge of the apparatus.

But, quite apart from this, the chemical reaction by which acetone is produced, whether from acetates or from acetic acid, was well known for more than half a century before the date of this patent. What is really covered by the patent is certain specified and de-

---

At 350° C. 38·3 pounds of absolute acid was run in, and
38·1 " " " " came through with no signs of any
decomposition—no acetone.

At 400° C. 36·1 pounds of absolute acid was run in, and
29·9 " " " " " received undecomposed, leaving
6·2 " " " " decomposed, and this decomposed
acid gave 97 per cent. of the acetone required by theory.

At 450° C. 35·1 pounds of absolute acid was run in, and
18·5 " " " " " received undecomposed, leaving
16·6 " " " " decomposed, which apparently gave
112 per cent. of the acetone required by theory.

At 500° C. 41·4 pounds of absolute acid was fed in, and
10·8 " " " " " received undecomposed, leaving
30·6 " " " " decomposed, which apparently gave
104 per cent. of the acetone required by theory.

At 550° C. 40·4 pounds of absolute acid was fed in, and
5·1 " " " " " received undecomposed, leaving
35·3 " " " " decomposed, which apparently gave
82 per cent. of the acetone required by theory.

Then a run of twenty-four hours was made at the last temperature, 550° C., to give opportunity for closer determinations of results.

321 pounds of absolute acid was fed in, and
57·3 " " " " " received undecomposed, leaving
263·7 " " " " decomposed, which apparently
gave 97 per cent. of the acetone required by theory.

The still was then opened, charged with 130 pounds of coarsely ground pumice-stone, and a parallel series of experiments made.

At 300° C. 41·8 pounds of absolute acid was fed in, and
39·1 " " " " " received undecomposed, leaving
2·7 " " " " decomposed, which apparently gave
33·5 per cent. of the acetone required by theory.

scribed apparatus and management, whereby an improved yield is to be obtained from acetates, and from acetates only, for the apparatus and management are not at all applicable to the use of acetic acid, and are not used either in form or substance.

At 350° C. 39·6 pounds of absolute acid was fed in, and
34·8 " " " " " received undecomposed, leaving

4·8 " " " " decomposed, which apparently gave

87·5 per cent. of the acetone required by theory.

At 400° C. 41·8 pounds of absolute acid was fed in, and
28·5 " " " " " received undecomposed, leaving

13·3 " " " " decomposed, which apparently gave

97 per cent. of the acetone required by theory.

At 450° C. 41·8 pounds of absolute acid was fed in, and
13·0 " " " " " received undecomposed, leaving

28·8 " " " " decomposed, which apparently gave

95 per cent. of the acetone required by theory.

At 500° C. 43·4 pounds of absolute acid was fed in, and
8·8 " " " " " received undecomposed, leaving

34·6 " " " " decomposed, which apparently gave

96·4 per cent. of the acetone required by theory.

At 550° C. 43·4 pounds of absolute acid was fed in, and
7·4 " " " " " received undecomposed, leaving

36·0 " " " " decomposed, which apparently gave

100 per cent. of the acetone required by theory.

Then a run of twenty-four hours was made at the last temperature, 550° C., as a check upon the previous results.

345·5 pounds of absolute acid was fed in, and
69·5 " " " " " received undecomposed, leaving

276·0 " " " " decomposed, which apparently gave 104 per

cent. of the acetone required by theory.

This last and three other impossible results are, as yet, unexplainable, but they may be reasonably charged to the uncertainties in the use of an hydrometer and the iodoform process of assaying.

ACETONE-CHLOROFORM.

The history of acetone-chloroform dates distinctly back to 1832. In the Annalen der Pharmacie, 1832, Vol. XXI, p. 198, Liebig describes the preparation of chloroform in large quantity, from given proportions of hypochlorite of lime, water and alcohol, and he says the yield will be equal in weight to the alcohol used. He then goes on to say that chloroform may also be obtained in large quantity by treating acetone with hypochlorite of lime under the same conditions.

Liebig does not give the yield from acetone; but after giving the yield from alcohol as being equal in weight to the alcohol used, he says it is obtained in large quantity from acetone.

In 1835, Dumas and Péligot[10] state that when a solution of hypochlorite of lime is distilled with wood spirit there is obtained, as a matter of fact, some ordinary chloroform. The experiment is as easy as with alcohol or acetone.

Liebig, in his text-book,[11] gives a formula and directions for the manufacture of chloroform from either acetone, alcohol or wood spirit, and gives to acetone the leading place.

M. Bonnet,[12] at a meeting of the Academy, says: "I have obtained, in the distillation of equal parts of acetate of lime and hypochlorite of lime, in a stone retort, a very large quantity of chloroform, and far more easily than by the methods of preparation that are known."

Dr. Reich[13] proposed and used hypochlorite of sodium in place of hypochlorite of lime, on account of the uneven amount of chlorine in the latter. He distilled together 2 pounds each of hypochlorite and acetate of sodium and received 5 to 6 drams of chloroform and 12 to 14 ounces of acetone and water. This latter was again distilled with 4 to 6 ounces of hypochlorite, and again a considerable amount of chloroform and acetone was received. The last operation was repeated with a new portion of hypochlorite, and then the total amount of chloroform was 8 to 10 ounces, with still some excess of acetone for future operations.

Acetone, when distilled with hypochlorite of sodium, yields chloro-

---

[10] Annales de Chimie et de Physique, Vol. LVIII, p. 15.

[11] Traité de Chimie Organiques, Vol. I, p. 576.

[12] L'Institut, No. 196, Februar 1837.

[13] Archiv. der Pharmacie, Zweite Reihe, 1848, Vol. LV, p. 65.

form in the proportion of 4 ounces of acetone to 5 to 5½ ounces of chloroform.

Prof. Böttger[14] distilled together equal quantities of commercial bleaching powder and crystallized acetate of sodium and obtained chloroform and acetone. Then he distilled the excess of acetone with a fresh portion of bleaching powder, and had "great joy in seeing from this second operation a very considerable quantity of the purest chloroform distil over, together with some acetone still undecomposed." The excess of acetone was again distilled with fresh bleaching powder and the process repeated until, by three to four distillations, all the acetone was used; the yield of chloroform being about 4 ounces to each pound of bleaching powder.

Chloroform made directly from acetone, which he says is at present (1848) to be had in the market, is obtained in the proportion of 1 ounce and 2 drams of chloroform from 1 ounce of acetone.

Still in the year 1848 (see *Archiv. der Pharmacie*, 1848, Vol. LIV, p. 23), Prof. Heinrich Wackenroder, one of the editors of the *Archiv.*, says, in substance: "The great practical interest in chloroform at the present time calls, first of all, for a closer examination of the methods for making it. Therefore, I have induced Mr. Siemerling to undertake, in my laboratory, some experiments relating to the preparation of chloroform, which are in the most recent publications on the subject. Although these experiments have, in no respect, given the results which were hoped for, it nevertheless seems to be worth while to call attention to them for the sake of the future continuation of the subject."

Then follows the paper of Mr. V. Siemerling, and at page 26: "II. Preparation of Chloroform from Acetone."

"According to the statement of Professor Böttger, 1 ounce of acetone, which has been mixed with hypochlorite of lime to a pasty mass, should give 1 ounce and 2 drams of chloroform. As this seemed to be an easy and advantageous method of preparation, some experiments were made with acetone procured from the factory of Trommsdorff, in Erfurt, but they did not accord with the statement of Böttger.

"In the first experiment (*a*) 30 grammes of acetone was mixed with 50 grammes of hypochlorite of lime and 50 grammes of water,

---

[14] Polytechnisches Notizblatt, 1848, Vol. III, p. 1.

and distilled. The chloroform was separated and rectified with concentrated sulphuric acid. The yellow chloroform thus obtained was again rectified from burnt lime, when it had an empyreumatic odor —quantity not given."

In experiment (*b*) 30 grammes of acetone, 120 of hypochlorite and enough water to make a pasty mass, were mixed and distilled. It is true much chloroform came over, but there was also undecomposed acetone as well. It was repeatedly washed with water and rectified over chloride of calcium, in which rectification there was a pretty large loss every time, but the number of times is not given. The yield was 9 grammes.

Experiment (*c*), since in both experiments undecomposed acetone distilled over the quantity (proportion) of hypochlorite was increased, and 30 grammes of acetone to 150 grammes of hypochlorite, with water were mixed to a pasty mass, allowed to stand twenty-four hours, and were then distilled. The product contained much chloroform, but also undecomposed acetone; therefore, it was put back into the retort with 40 grammes of fresh hypochlorite and again distilled. The chloroform thus obtained still contained acetone, from which it was purified by repeated washing with water, and then rectified over chloride of calcium. The yield was 10 grammes of chloroform.

Another experiment (*d*) is given, wherein 20 grammes of acetone and 60 grammes of hypochlorite were distilled together without water, but with unfavorable result, the yield being 6 grammes of chloroform.

The specific gravity of the chloroform obtained from acetone, after repeated rectifications over chloride of calcium, was only 1·31, and it always contained some acetone; and the largest yield by Böttger's process was one-third of the acetone used. This differs considerably from his statement that 1 part of acetone yielded 1¼ parts of chloroform.

Siemerling then goes on to say that if we assume, with Liebig, that acetone is composed of 1 atom of acetyloxide and 1 atom of methyloxide, and explain in this way the formation of chloroform from methyloxide, it naturally follows that we must get less chloroform than the acetone used.

The sum of the elements of 1 atom of acetyloxide $= C_4H_6O$, and 1 atom of methyloxide $= C_2H_6O$ is equivalent to 2 atoms of acetone

$= C_6H_{12}O_2$. In 30 grammes of acetone there are, therefore, 11·8 grammes of methyloxide, which, since 4 atoms of methyloxide consist of the same elements as 2 atoms of alcohol, can form 15·1 grammes of chloroform, assuming that complete decomposition takes place.

According to the theory, half of the acetone used must be recovered as chloroform; but since in the practical manufacture of chemical products the quantity prescribed by theory is never obtained, it should be considered a favorable result when one-third of the acetone used is obtained as chloroform, especially as the experiments were made only on the small scale.

From these experiments, it follows that the preparation of chloroform from acetone is quite unfit for practical use. Were even the quantity of chloroform stated by Böttger as obtainable from acetone possible, it would have the disadvantage of being freed from acetone with very great difficulty.

The paper of Siemerling, from which the above abstract is made, seems to have received the endorsement of Wackenroder, although it controverts the statements of both Reich and Böttger, and it may be from his high authority as much as from the paper itself that the results seem to have been accepted and quoted by Gmelin,[15] Watts,[16] and other reference authorities, and the influence of the publication seems to have been, so far as the literature of the subject goes, to prevent or obstruct the acetone process for many years. As it was so long and so well known, manufacturers may have been, and probably were, using the process privately; but up to 1881–1883[17] very little information on the subject is found. Still, the work and the conclusions of Siemerling must have been known to be grossly erroneous by every one whose interest it became to try them. Calculations would show to any one that when ordinary acetone and bleaching powder were used, the proportions required are about 1 to 10, or about double the largest proportion of hypochlorite used by Siemerling, and the resulting chloroform should be about double the weight of the acetone used; and many who preceded Siemerling knew better than he how to save and utilize the great excess of acetone or deficiency of hypochlorite taken.

---

[15] Handbook of Chemistry, Vol. VII, p. 346.

[16] Dictionary of Chemistry, 1883, Vol. I, p. 918.

[17] Sadtler, AM. JOUR. PHAR., July, 1889, p. 321.

But the Siemerling results were very faulty and very misleading in other respects. The present writer, having learned from all the work of the past on the subject that any excess of acetone used could be easily recovered and used again, added to this knowledge, from his own experience, the fact that, where an excess of acetone was taken, the hypochlorite was more economically and more promptly utilized, and the resulting chloroform was cleaner. Having gained from the Siemerling process this step, the writer was prepared to try that proportion and process critically, and he found that, as a table experiment, it was quite impracticable, by any reasonable degree of mismanagement, to obtain so low a result. In two fairly careless trials from 30 grammes of 96 per cent. acetone, the yield of chloroform was 23 grammes in one case and 32 grammes in the other, instead of Siemerling's 10 grammes. In larger trials of his proportions up to 280 pounds of absolute acetone to one cask of 1,400 pounds of 33 per cent. bleaching powder in one charge, the yield was not less than 200 pounds of chloroform, and about 130 pounds of recovered acetone, thus proving conclusively the gravity of the unaccountable errors of the Siemerling work, and showing a basis for the mischief done by this bad work.

Looking back from this later day at the authoritative way in which these mistakes and misstatements of Siemerling were published and quoted, it is easy to see that nothing could be better adapted to obstruct or prevent any increase in the general production of acetone-chloroform, and to confine its production to those manufacturers who were using the process secretly.

One of the definite evil consequences of this Siemerling paper was the adoption of its erroneous results as the basis of the following patent:

On June 23, 1886, Gustav Rumpf applied for a patent, and on July 5, 1888, patent No. 383,992 was issued to him for the invention of "a new and useful Improvement in the Manufacture of Chloroform from Acetone," of which the following is a specification: "The essential feature of this invention is based on the discovery that acetone, when treated in the proper way with a hypochlorite—for example, chloride of lime—will yield a larger quantity of chloroform than has been heretofore known. Watts, in his Dictionary of Chemistry, edition of 1883, Vol. I, page 918, says that the manufacture of chloroform from acetone cannot usefully be carried out,

not only because the price of acetone is too high, but particularly because acetone yields about 33 per cent. of its own weight of chloroform when it is treated with chloride of lime. Watts distilled 30 grammes of acetone with 150 grammes of chloride of lime, and rectified the watery distillate with 40 grammes of chloride of lime. I have discovered a method whereby it is possible to obtain a yield of chloroform from acetone very much greater than that obtained by Watts. I have found that the reaction may be made to take place in such a way that one equivalent of acetone will yield one equivalent of chloroform by volume, or about 180 per cent. by weight, and the advantages of my invention may be secured in a greater or less degree by properly employing with about 58 pounds of acetone more than 300 pounds of good chloride of lime. The best results and greatest yield of chloroform can, as I have found, be obtained by the use of, say, 58 pounds of acetone to at least 600 pounds of a good chloride of lime containing about 35 per cent. of available chlorine, and in proportion if the chloride of lime is poorer. The yield of chloroform will then be from 150 per cent. to 180 per cent. of the weight of the acetone employed, instead of about 33 per cent."

Then follow claims for invention of diluting the acetone and of introducing it periodically during the process—of introducing it below the surface of the solution in the still—of the use of a mechanical stirrer, and of the use of a still and condenser, which are described and figured.

The basis upon which this patent rests, for its reason to be, is the quotation from Watts' Dictionary. Watts quotes the process from *Gmelin's Handbook*, and Gmelin quotes it from *Siemerling's Paper* in the *Archiv. der Pharmacie*, 1848, Vol. LIV, p. 26. Now, as the paper and quotations are grossly erroneous, and as writers of preceding papers publish results that approximate those of the patent, it might reasonably be asked: what is the value of the patent? But the present writer, while intending to make acetone-chloroform, very earnestly desires to avoid all question in regard to the validity of this patent, and, therefore, uses the Watts (Siemerling) process, which is outside the limit claimed by the patent, with an entirely different apparatus and management, described by him in 1857, and republished in *Ephemeris*, Vol. IV, No. 1, p. 71.

It is proposed to use charges of 280 pounds of absolute acetone

to 1,400 pounds of 35 per cent. bleaching powder, 1 to 5—to pass the resulting chloroform through scrubbers, then distil it through water—then distil it from a small portion of bleaching powder—then pass it through sulphuric acid scrubbers, and finally rectify it in three fractions, the large middle fraction being accepted, and the others being worked over.

A part of the great excess of acetone taken in the 1 to 5 proportion is recovered by continuing the distillation after the chloroform is all over. Another part is recovered in the wash water from the scrubbers and the distillation, and the small remainder is decomposed by the small proportion of bleaching powder, the total amount recovered being practically not far from the total excess.

To this recovered acetone, carefully assayed, new acetone is added to make up the 280 pounds for the next charge.

The patentees were invited to see this apparatus and process in order to convince them that there is a strong desire to avoid any color of infringement, by taking the Siemerling proportions which are excluded from their patent. But they took the ground that this was a mere evasion, or getting round their patent by using the excess of acetone over again, and could not be made to see that this, if objectionable, is so by defect in the equity of the patent, and is a proceeding that antedated the patent by many years. And finally, they covered everything by claiming that the patent secured to them the sole right to make chloroform from acetone in the United States, thus claiming a reaction that had been well known for more than fifty years.

As to the reasons why large manufacturers of chloroform did not avail themselves earlier of the acetone process, the first answer is that it is probable that many of them, in Germany, at least, did so secretly as soon as acetone became cheaper than alcohol.

But as to other more positive reasons, the writer, as having been for many years a large manufacturer from alcohol, and as having, with all other makers, given up the manufacture rather than contest this patent, can only speak for himself. He for many years doubted the identity of alcohol and acetone-chloroform, and doubted whether the latter was as easily purified for use as the former, so that when chloroform was offered to him at so low a price as to insure that it was made from acetone it was refused. Chloroform has always been a most important agent, and during the early part of

its career the numerous fatalities from its use were charged to its impurities, so that the alcohol process was adhered to until the identity of the products from alcohol and acetone was fully proved—not only chemically, but also by surgical experience of considerable duration. Then as time passed and the subject came up for research and reconsideration, the Siemerling results came up also and settled the question against acetone.

Finally, Dr. Gustav Rumpf, a German, and an employee for some years in an acetone-chloroform manufactory in Germany, where there is no patent, came to this country, took out these patents and assigned them to the present holders, so that now, for the past seven years or more, any one making acetone-chloroform in this country, by processes that had been free and largely used in Germany for many years, was liable to prosecution for infringement.

Having any general knowledge of the history of acetone and acetone-chloroform, it is difficult to understand how such patents could be issued that would claim to control the proportions of well-known chemical materials in long-known chemical reactions. But such patents were issued, and, therefore, command respect. That the processes were not used earlier in this country may be charged chiefly to the endorsements of the Siemerling paper; and that the patents appear to have been so long acquiesced in is due to the circumstance that any one who might contest them would do so at great cost of money, time and annoyance in defensive litigation which, if successful, would secure the benefits equally to many manufacturers and to the public in lower prices of the products, whilst the contestant would bear all the costs.

In seeking new outlets for acetic acid, the writer determined to convert the acid into chloroform, and determined also to respect these patents. In the intermediate step of making acetone, acetic acid was used, not to evade the patents, but because by its use the impurities of the crude acetates of lime were avoided, and a larger yield of better acetone was obtained. In the use of acetic acid instead of the acetates of the patent an entirely different apparatus and management are required and used, and if the patent did not exist the writer would not use either its apparatus or management, but would prefer the rotary still and the continuous process.

With regard to the other step, wherein the acetone is converted into chloroform, this is accomplished by a reaction that was long

and well known before the date of the patent, and the proper proportions of the materials required for the reaction were easily obtainable by calculation, and this knowledge also antedated the patent. The patent then simply covers a specially devised and described apparatus and management which the writer does not use, and does not want to use, even if they were not patented, but much prefers his old form of apparatus and management described in 1857, and used for many years in making alcohol-chloroform; and the successful use of this apparatus and management for acetone-chloroform is simply in accordance with the statement of Liebig, in 1832, that acetone could be successfully used under the same conditions as alcohol.

SOME CONSTITUENTS OF THE ROOT OF POLYGONUM CUSPIDATUM.[1]

By A. G. Perkin, F.R.S.E.

Among the different varieties of the species of Polygonum, that best known is perhaps the *P. tinctorium*, the leaves of which are used as a source of indigo in China, Japan, and some parts of Russia. Of others, the *P. aviculare* and *barbatum* yield a blue color, probably indigo, and the *P. hydropiper* and *tortosum* are said to contain a yellow coloring matter; moreover, the roots of some of these varieties possess medicinal value.

The *P. cuspidatum*, which is common in parts of India, China and Japan, has evidently attracted but little attention, the only reference found bearing on its properties being the following, contained in a paper (*Journal Royal China Branch of Royal Asiatic Society*, 22, New Series, No. 5, 1887), by A. Henry, M.A., L.R.C.P., entitled "Chinese Names of Plants," "*Kan-yen, wu-tzu*, name at Patung for the root of *P. cuspidatum*, which is said to be used for dyeing yellow."

The roots, which somewhat resemble those of madder and morinda, vary in diameter from ¼ inch to 1 inch when fresh, and consist of a thick, succulent bark, internally of an orange-red color, and a central light yellow woody portion; the former, on drying, shrivels considerably and becomes lighter in tint.

[1] Abstracted by J. C. Peacock from the *Journal of the Chemical Society*, December, 1895.

As examination showed that the woody portion contained but little extractive matter, the bark only was employed.

The ground root bark was extracted with boiling alcohol, and the resulting orange-brown extracts evaporated to a small bulk. This was treated with water and extracted with ether, which removed small quantities of emodin and wax. An addition of baryta water to the aqueous liquid produced a dirty white precipitate, which was removed by filtration. The deep red filtrate, after being neutralized with acetic acid and saturated with common salt, was extracted with a large volume of ethylic acetate, and the extract evaporated. This treatment furnished a product which appeared under the microscope as a mixture of gelatinous and crystalline matter. This mixture was dissolved in boiling alcohol. On evaporating to a small bulk and cooling, the liquid deposited a gelatinous matter; directly this ceased to form, it was rapidly filtered, and the crystalline substance which separated from the filtrate was collected and purified by crystallization from acetic acid. It then consisted of a glistening mass of orange-yellow needles, which, when heated, softened at 200° and melted at 202°–203°. It is but sparingly soluble in ethylic acetate, boiling water and boiling alcohol. From its solution in the last solvent it is deposited in a gelatinous condition if rapidly cooled, but when left to cool slowly it separates as a bulky mass of hair-like needles. It is almost insoluble in ether. With cold dilute alkalies or baryta water, it yields orange-red liquids, and by treating a boiling alcoholic solution of the substance with alcoholic potash, the potassium derivative separates, on cooling, in the form of red, flat, microscopic needles. The lead salt, an orange-red amorphous powder, somewhat soluble in boiling water, is formed, when lead acetate is added to an alcoholic solution of the substance.

Analyses of the crystals gave the following numbers:

				Required for $C_{21}H_{20}O_{10}$
Carbon	58·28	58·48	58·48	58·33
Hydrogen	4·92	5·04	5·02	4·63

Experiments showed the substance to be a glucoside, and, in order to determine its nature, a solution in 60 per cent. alcohol was digested at the boiling heat with a small quantity of hydrochloric acid. During this operation, the light yellow liquid became orange-red, and crystals separated. Water was added, the mixture allowed

to cool, the product collected, washed with water, and dried at 120°. It formed orange-red needles, readily soluble in alcohol. They melted at 253-254°, and sublimed at higher temperatures with partial carbonization. A study of the decomposition products and derivatives of the substance showed it to be emodin, which exists in rhubarb root and also in the bark of *Rhamnus frangula*, as a glucoside (Trans., 1892, 61, 1, Thorpe and Miller).

A determination of the amount of emodin produced by the hydrolysis of the glucoside gave 61·82 per cent. as the result. This is in accordance with the following equation, which requires 62·50 per cent.

$$C_{21}H_{20}O_{10} + H_2O = C_{15}H_{10}O_5 + C_6H_{12}O_6.$$

The filtrate from the emodin, after neutralization with silver carbonate, and evaporation, yielded an almost colorless syrup, which reacted with phenylhydrazine acetate on gently warming, lemon-yellow aggregates of an osazone being deposited on cooling.

Frangulin, the only glucoside of emodin hitherto known, and found in *Rhamnus frangula*, is not identical with the above. When hydrolyzed, for instance, it yields emodin and rhamnose (Thorpe and Miller, *loc. cit.*),

$$C_{21}H_{20}O_9 + H_2O = C_{15}H_{10}O_5 + C_6H_{10}O_5,$$

a reaction which requires 64·9 per cent. of emodin; and its difference in composition ($C_{21}H_{20}O_9$ requires C, 60·57; H, 4·80), crystalline appearance, solubility and other properties from the glucoside found in *Polygonum cuspidatum*, show clearly that they are distinct substances. Polygonin is the name proposed for this new glucoside of emodin.

The gelatinous residue obtained during the purification of the polygonin had the properties of a glucoside, and, upon hydrolysis by digestion with dilute hydrochloric acid, yielded emodin, and a second substance which differed from emodin by melting at 199°, and by being sparingly soluble in alcohol and insoluble in dilute ammonium hydrate. This substance was identified as emodin monomethyl ether, which has been found to exist in the root bark of *Ventilago madraspotana* in the free state (Perkin and Hummel, Trans., 1894, 65, 932).

It is interesting to note that Schwabe (*Arch. Pharm.*, 1888, 26, 569), and subsequently Thorpe and Miller (Trans., 1892, 61, 6), isolated from the bark of *Rhamnus frangula*, not only frangulin, but a

second substance, to which they respectively assigned the melting points 199° and 202°–203°, and this was considered by the latter authors to be probably a trihydroxymethylanthraquinone isomeric with emodin. The properties of this substance agree very closely with those observed in this investigation for emodin monomethyl ether, and it appears possible that they may be identical.

The ethereal extract obtained during the isolation of the polygonin was extracted with dilute alkali, which removed an exceedingly small quantity of emodin. The remaining ethereal solution, upon evaporation, left a wax which, after recrystallization from boiling alcohol, was obtained in beautiful, colorless leaflets, which resembled phenanthrene in appearance, and melted at 134°–135°. A combustion gave:

		Required for $C_{18}H_{28}O$.
Carbon	83·19	83·08
Hydrogen	11·60	10·75

This result and its physical properties make the wax identical with that of the root bark of *Morinda umbellata* (Perkin and Hummel, Trans., 1894, 65, 867).

Dyeing experiments with the roots, using mordanted calico, showed, as was to be expected from the chemical examination, that it was devoid of useful tinctorial properties; faint, dull shades were obtained, evidently due to the presence of a small quantity of tannin matter. It is thus evident that no yellow coloring matter is present in this portion of the plant. Examination, however, showed that the leaves contain a small quantity of a substance which yields yellow shades with alumina mordant, and it is possible that some confusion has arisen between the leaves and the root with regard to this property.

A new serum has been brought out by the New York Biological and Vaccinal Institute, known as *Gibier's Double Antitoxin*, which contains the diphtheria and streptococcus antitoxins, obtained from one horse immunized against both infections.

An investigation of *Bismuth Subnitrate* has been made and reported by Dr. Charles O. Curtmann, of Pharmacopœia Research Committee D. The conclusions arrived at are that nearly all commercial specimens are more basic than is demanded by the usually accepted symbolic formulæ, or else they are mixtures, in indefinite proportions, of bismuth hydroxide with the true subnitrate. The latter is most likely the correct view.

EDITORIAL.

ROENTGEN'S RAYS.

Considerable attention has recently been excited in scientific circles by what is popularly designated as *Roentgen's Discovery.*

Professor Wilhelm Conrad Roentgen, of Wurzburg, Germany, noticed that the light of an induced electric current in a Crookes' tube affected a photographic plate that was enclosed between two wooden slides. In other words, he found a light capable of penetrating wood. He immediately instituted a series of investigations by which he demonstrated that it is possible to photograph through many substances that are opaque to ordinary light; wood, flesh, leather, paper and certain metals are the most conspicuous substances which he found to be transparent to these rays.

These phenomena have since been investigated by a number of other physicists, and Roentgen's observations have been confirmed.

Mr. Campbell Swinton, in London, demonstrated that, among the metals, aluminum is especially transparent to these new rays. He placed two aluminum trays between the source of these rays and a photographic plate; one of the trays contained a solution of alum and the other a solution of iodine in carbon disulphide. It is known that alum solution absorbs ultra-red, and iodine solution ultra-violet rays of light. The conclusion reached by Mr. Swinton was that the new light contains rays which are absorbable by iodine, and it is probable that they are ultra-violet rays.

In this country, Professor Wright, of Yale University, found that with many substances strong impressions were obtained upon a photographic plate even when it was enclosed in an opaque wrapping of black paper and covered with a piece of pine board one-half inch in thickness.

One of the most peculiar observations made on this light is that glass is more opaque than many of the metals, while ebonite, which is practically opaque to ordinary light, is transparent to the new rays.

The term X-rays has been provisionally applied to this new form of energy.

On another page we give the results of some experiments by Professor E. S. Bastin, of the Philadelphia College of Pharmacy, on the presence of these, or similar, rays in sunlight. His experiments were made on the 17th of February, and we believe he is among the first to announce positive results from sunlight, although so rapidly is the study of Roentgen's discovery progressing, he may be anticipated by some one else before his paper can appear in print.

It is too soon to predict the uses to which these X-rays may be applied, but it is already evident that the bones in the living subject may be examined by them, since flesh is transparent to them, while bone is opaque. No doubt the discovery will be of some use in surgery; in fact, it is claimed that a number of successful operations have already been performed in which foreign bodies have been first located by the aid of these rays. In Berlin the photograph of a man's hand revealed the presence of a piece of glass that had been imbedded in the flesh for years. Defects in metal castings may be detected by this light; hence, it is thought it will be especially of service to indicate flaws in large guns.

Professor Bastin hopes to study the structure of living plants by these rays, if he is so fortunate as to find that some tissues are opaque while others are transparent.

THE METRIC SYSTEM IN THE UNITED STATES.

We have received a communication from the American Metrological Society, whose headquarters are at Columbia College, New York, concerning a bill which is now before Congress for the compulsory introduction of the metric system in the United States.

The bill has passed second reading in the House, and has been referred to the Committee on Coinage, Weights and Measures. The following is a copy of the bill:

"*A Bill* to fix the standard of weights and measures by the adoption of the metric system of weights and measures.

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That from and after the first day of July, 1897, all the departments of the Government of the United States, in transaction of all business requiring the use of weight and measurement, shall employ and use only the weights and measures of the metric system, as legalized by Act of Congress approved July 28, 1866.

"SEC. 2. That from and after the first day of July, 1899, the metric system of weights and measures shall be the only legal system of weights and measures recognized in the United States.

"SEC. 3. That the tables in the schedules annexed to the bill authorizing the use of the metric system of weights and measures, passed July 28, 1866, shall be the tables of equivalents which may be lawfully used for computing, determining and expressing in customary weights and measures the weights and measures of the metric system."

The United States could not take a wiser step on this subject than make this bill a law. Unless some such decisive action is taken, the country will drag through another century with a system of weights and measures which is as inconvenient as it is unpractical.

The only way to adopt a system like this is to place the weights and measures in the hands of those who are to use them; the whole thing then becomes ridiculously simple.

Those who are in sympathy with this movement should write to the Hon. C. W. Stone, Chairman of the Committee on Coinage, Weights and Measures, and signify their approval of House Bill No. 2,758, introduced by the Hon. Mr. Hurley.

THE LIBRARY OF THE PHILADELPHIA COLLEGE OF PHARMACY.

Mr. Howard B. French has recently presented to the Library of the College some 2,500 volumes from the library of the late Dr. Ruschenberger. This magnificent donation brings the total number of volumes in the Library up to about 10,000.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

ETIDORHPA, OR THE END OF EARTH. By John Uri Lloyd. Second edition. The Robert Clarke Company, Cincinnati, 1896.

About four months ago, Professor Lloyd issued the author's edition of this book to those who had been so fortunate as to previously subscribe for it. He soon found, however, that there were a large number of disappointed people who had been unable to secure copies of the work, and that the only recourse left for him was to issue a second edition. This he has done, and the result is

a volume which is a credit to both author and publishers. Two new illustrations have been added to this edition, otherwise its pages bear a close resemblance to those of its predecessor. Neither edition was issued for personal gain, and the author pledges himself to place any profit to the credit of the Lloyd Library, which will eventually be devoted to public educational purposes. We predict that the author will find the second edition exhausted almost as readily as the first.

SELECT EXTRA-TROPICAL PLANTS. By Baron Ferd. von Mueller. Ninth edition. Robert S. Brain, Government Printer, Melbourne, Australia, 1895.

The object of this work is to bring together some condensed data in popular language on all the principal economic plants hitherto known to prosper beyond the equinoctial zone. Information of this kind is widely scattered, and often only accessible through voluminous and costly works in various languages.

In 654 octavo pages, the author has condensed an immense amount of useful information. His lucid literary style has made the book very readable, and his judicious selection of all extra-tropical plants which have any present or prospective value, makes it almost an encyclopædia of economic botany. No geographical section is especially favored, one can find the useful plants at his door in this country as fully described as those growing in Australia or India.

PRACTICAL STUDIES IN FERMENTATION, being contributions to the life history of micro-organisms. By Emil Chr. Hansen, Professor and Director of the Carlsberg Physiological Laboratory, Copenhagen, translated by Alex. K. Miller. London: E. & F. N. Spon; New York: Spon & Chamberlain, 1896.

The investigations brought together in this book treat in the main of the great questions of the circulation in nature of the alcoholic fungi, their relationship to the diseases of beer, the pure cultivation of yeast and the employment of systematically selected species and races. In the first chapter the author gives some historical data concerning the introduction of pure yeast cultures into the brewing industry, which he accomplished over twelve years ago. The results at first were of doubtful utility; but gradually, as more information was gained, it was found that objectionable bacteria were not alone the cause of some of the commonest and most serious diseases of beer, but that turbidity and objectionable changes in flavor were frequently caused by certain species of yeast. It was found, therefore, "that the pitching yeast should consist only of a single species, namely, that best suited to the brewery in question."

The author then gives a brief account of his own method of pure cultivation, and points out how his theories and practice differ from other well-known investigators, notably Pasteur. Altogether, it is a book full of interest, not only to those connected with the brewing industry, but to everyone interested in fermentation and the natural history of micro-organisms.

FORMULAIRE DES MÉDICAMENTS NOUVEAUX POUR 1896. Par H. Bocquillon-Limousin. Avec une introduction par Henri Huchard. 7e édition. Paris: J.-B. Baillière et Fils.

Everyone interested in the newer remedies will examine this book with profit. The most notable novelties for this year are: Airol, Apolysine, Argonine, Benzacétine, Cannabindone, Caséinate de fer, Citrophène, Cotarnine, Cristallose, Cuprohémol, Dihydrorésorcine, Eudoxine, Ferripyrine, Gallicine,

Hémogallol, Hémol, Hypnoacétine, Lysidine, Nosophène, Pain d'aleurone, Périodure de thalline, Phosphergot, Pixol, Résorbine, Salantol, Salithymol, Sublimophénol, Tannigène.

It is not only the very new remedies that have received attention, but some older ones; for example, there are four formulas given for paregoric. The volume for 1896 is fully up to its predecessors.

NOTES ON A FEW PYRIDINE ALKYL IODIDES. By Albert B. Prescott. Reprint from the *Journal of the American Chemical Society*, January, 1896.

DIPYRIDINE TRIMETHYLENE DIBROMIDE, and A STUDY OF CERTAIN ADDITIVE REACTIONS OF ORGANIC BASES. By R. F. Flintermann and A. B. Prescott. Reprint from the *Journal of the American Chemical Society*, January, 1896.

CONSTANTS OF THE ELEMENTS, AND TABLE OF CHEMICAL CLASSIFICATION. Two charts prepared by Wm. H. Seaman, M.D., Washington, D. C.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, February 18, 1896.

The regular Pharmaceutical Meeting was held in the Museum of the College at 3 o'clock. Mr. Joseph W. England was chosen chairman, and the minutes of the previous meeting were ordered to stand as published.

The presentation to the College Library of about 2,500 volumes by Mr. Howard B. French was announced by the Registrar. This valuable addition to the library comprises works on medicine, pharmacy and allied subjects, and increases the total number to about 10,000 volumes.

The chairman presented to the Museum, on behalf of Messrs. John Wyeth & Bro., a specimen of "red gum," which is a product of Eucalyptus rostrata. It is soluble in both alcohol and water. The tincture does not gelatinize, and its peculiar adhesive property, when applied to the mucous membrane, renders it efficacious as a local astringent. It has also been recommended for sea-sickness (AM. JOUR. PHARM., 1890, p. 347).

The first paper, entitled "The Shaddock, or Grape Fruit, and Some of Its Applications in Pharmacy," was read by Mr. Lyman F. Kebler, on behalf of Mr. Charles H. LaWall, the author. (See page 121.) This paper is an interesting one, and it is a valuable contribution to botanical literature, as the history of this member of the Citrus genus is extensively reviewed, and many conflicting statements contained therein brought to notice. The botanical characteristics of the members of the group are also fully considered, in order to establish, as far as possible, the identity and relationship of the different varieties. It was accompanied by samples of the fruits, including both those having a white pulp and those having a red pulp, and known by the vernacular names of Adam's apple, grape fruit and forbidden fruit; and, also, by photographs from Sandford, Fla., illustrating the appearance of the trees during the fruit-bearing season, and a specimen of grape fruit wine from the same locality, both of which were presented by Miss Bertha L. De Graffe.

The chairman remarked upon the merits of the paper, and said he was sure that he voiced the sentiments of the meeting in expressing his regret for the absence of Mr. LaWall.

Professor Trimble spoke of the possibilities of this fruit in pharmacy, and

also of the amount of work required in preparing such a paper, in consulting various works of reference, and that Mr. LaWall had found it advisable to make two papers, and report at another time on the chemistry of the subject.

Professor Bastin gave as his opinion that some of the varieties are probably hybrids with the orange family, and that the shaddock proper bears a resemblance to the orange both in appearance and taste, and, as the plants have been cultivated from time immemorial, it is very difficult to distinguish the species.

The next paper, entitled "Bitterless Cascara Sagrada," was read by Professor Remington, upon whose request it was contributed by Mr. Henry B. Gilpin, of Baltimore. (See page 135.) Professor Remington spoke of Mr. Gilpin's liberality in thus consenting to publish a formula which has particular significance when considered from the commercial standpoint. Samples of the aromatic powder and of the aromatic bitterless fluid extract were shown, and the quality of these preparations could be judged from their fine appearance.

Mr. W. L. Cliffe commented favorably upon the process of macerating the drug with magnesia and water before drying, to neutralize the bitter principle, and said that the same object could not be attained with the use of dilute alcohol.

Professor Trimble wished to know whether any of those present had tried the use of ammonia instead of magnesia. Mr. England said that he had used it to advantage in the preparation of the syrup.

The last paper on "The Use of Oxalic Acid in Preserving the Color of Plants," was presented by Mr. J. Henry Schroeder. (See page 132.)

Mr. Schroeder exhibited an interesting collection of specimens, including plants, the colors of which are the most difficult to preserve. These were collected last summer, and were preserved by pressing with a paper which had been saturated with a 3 per cent. solution of oxalic acid and dried.

Professor Bastin said that it was difficult to get such good results ordinarily, and that it was exceedingly important and desirable to find a preservative agent for the color of plants. He recommended selecting specimens of Baptisia and Salix for carrying on experiments, as the leaves of these plants very readily blacken, and suggested that two sets of specimens be prepared, one with the use of acid paper and the other without it, in order to demonstrate the utility of the method. He also advised exposing the specimens to the influence of light to determine the stability of the colors.

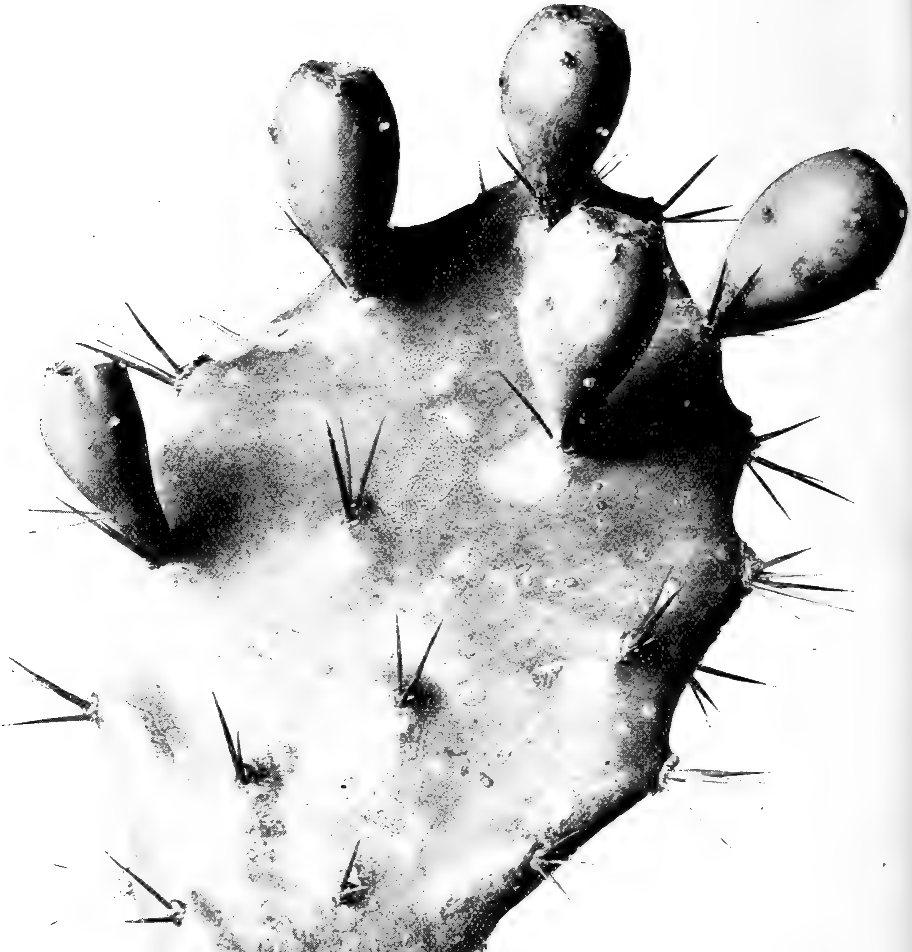
Mr. Schroeder, in replying to a query from Mr. Wallace Procter, said that the blue color of flowers is not affected by the presence of oxalic acid.

Mr. Procter showed samples of lard, beef and mutton suet and goose-grease, which were presented by Mr. Snyder, of the Snyder Pharmacal Company, of New York. These fats are said to be anhydrous and quite pure. The lard is made from leaf fat only, which is brought from the West during cold weather, and is obtained from hogs of medium size and corn-fed. The membranes are removed from the fat and it is put into a Miles cutter, which reduces it to the appearance of lard. Then it is washed and rendered with steam at a temperature not exceeding 212° F.; filtered through paper in a filter-press, heated *in vacuo*, to remove water, and agitated while cooling, with access of as little air as possible.

Mr. Kebler made a statement in reference to the tests for gurjun balsam. (See page 143.)

On motion, the meeting adjourned.

THOS. S. WIEGAND, *Registrar.*



OPUNTIA VULGARIS IN FRUIT.

THE AMERICAN
JOURNAL OF PHARMACY

APRIL, 1896.

OPUNTIA VULGARIS, MILL.

By Bertha L. DeGraffe.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy, No. 151.

The Cactaceæ, or family of plants to which Opuntia vulgaris belongs, is an American aboriginal. But the name Opuntia, that Tournefort gave to the large genus of mainly tropical cactuses, which includes the subject of this paper, was applied to an entirely different plant by Theophrastus, a few centuries before the present era. This name is believed to have been taken from that of Opus, a city which was then situated in the ancient State of Bœotia, but whose site is now in modern Locris. Since the discovery of America, however, several of the species have been naturalized to the Mediterranean region and now grow there abundantly. The juice of Opuntia tuna is said to be used in Naples as a rich carmine pigment.

The members of this genus, or their pear-shaped and often prickly fruits, are popularly designated as prickly pears or Indian figs.

Opuntia vulgaris is indigenous to the West Indies and near the east coast of North America, northward to Massachusetts, growing more abundantly in southern climes. The specific name vulgaris well signifies the profusion in which the plant may be found growing wild in some parts of this territory, while further westward and southwestward several other species of Opuntia are so plentiful as to be troublesome to agriculturists.

Of the numerous species of these plants, which have been more or less medicinally employed, Cactus (Cereus, Miller,) grandiflorus, Linne, has, of late years, attracted most attention from the medical profession, on account of its reputed effect in cases of functional palpitation of the heart, and in other cardiac disorders.

Other species are well known as the plants on which the cochineal insect feeds. But while of lesser importance in this respect, still Opuntia vulgaris shares the utility which the genus thus contributes. Hence, it is cultivated to some extent for economic purposes, and, like the other members of the family, quite frequently for ornamental uses.

The wild plant prefers sandy fields and dry rocks. It is prostrate or spreading. The branches or joints of the stem are light green, broadly obovate, about twice as long as wide, fleshy, varying from about one-fourth to three-fourths of an inch in thickness, and have minute, appressed, subulate, usually deciduous leaves arranged in a spiral order, with clusters of greenish-yellow bristles and spines (which are modified leaves) also in their axils. The buds, which appear upon the surface of the branches, have a resemblance to warts, and from their location project the greenish-yellow bristles, which are composed of numerous rigid, fusiform cells, wedged in among themselves at one extremity. The free ends of these cells are very hard, pointed and retrorse; and on account of these properties and the wedged position, the bristles have such a decidedly barbed character that when their points have pierced the cuticle they are firmly held. This objectionable feature is, of course, increased by the presence of the spines, and is the source of so much annoyance in the handling of the plant that it has been called devil's tongue.

The flower is pale yellow, about two inches broad, and usually has eight petals. The fruit of the order Cactaceæ, is a one-celled, many-seeded berry. In the case of Opuntia vulgaris, the fleshy fruit has somewhat the shape of a pear or fig, the joint consideration of which fact and of its palatable quality in the ripened state, no doubt, gave rise to the popular names prickly pear and Indian fig. At first it has the color of the stem, and, like it, is bristly, bearing about a dozen clusters of the minute bristles. These persist during the process of ripening, after which process the fruit is otherwise smooth, has a thick rind of waxy appearance, and a crimson or yellowish-purple color externally. It is about two inches long and

about three-quarters of an inch through its greatest diameter, from which it tapers unevenly to the base, as shown in the accompanying figure. It is truncate at the apex, the plane of which is the base of a conical cavity. The fruit contains about thirty seeds and a pulp of a rich, red color, and an acidulous, sweet taste. The average weight of the pears examined was about 20 grammes. Of this amount, more than 50 per cent. were rind; the seed constituted from 4 to 5 per cent., leaving less than half to be made up by the pulp.

The early formation of the coloring matter is of special interest; for almost as soon as the pear assumes definite shape there appears in its centre a speck of color, which increases in size as the pear grows, gradually spreading outward. The rind being the last portion to change color, the fruit is considered to be ripe when the outside is fully reddened. Along the west coast of Florida the ripening takes place about the first of December. The red color may be obtained as a juice having a tinge of purple, by simple expression.

Prof. Henry A. Smeltz, of Tarpon Springs, Florida, to whom I am indebted for valuable information concerning the development of the color, informs me that he has extracted the color by each of the following means, and has found no trouble from the instability of it, even when obtained from half-grown fruit:

(1) By maceration with acetic acid (glacial acetic acid, 1 part; water, 10 parts); this is an original process with him.

(2) By fermentation; he covers the fruit with water and sugar (water, 1 quart; sugar, ½ pound). Fermentation will proceed far enough in about a week at the temperature of 21° F. He then filters and adds sufficient alcohol to arrest further fermentation.

(3) Maceration with alcohol.

(4) Boiling with as little water as practicable, filtering and adding alcohol.

In all these processes the fruit is first cut into small pieces in order to facilitate the extraction of the color.

The author's experience with the third method was not one of success. One hundred and fifty grammes of the undried, ripened fruit were chopped into small pieces and macerated with official alcohol for five days. The fruit imparted to this solvent a deep wine-red color. The solution was separated from the undissolved material and allowed to stand. After a period of two weeks the color had changed to a light brown, and, upon further standing,

finally became pale yellow. Professor Smeltz attributes this fading of the color to a partial deterioration of the fruit during transportation. Another lot of the undried, ripened fruit was treated with official alcohol; but instead of allowing the red-colored solution to stand, the solvent was recovered by distillation, which left a residue having a bright red color. This residue was soluble in water, but insoluble in ether. Sodium and ammonium hydrates, sodium carbonate, hydrochloric and nitric acids, and ferric chloride, applied to separate portions of the water solution, caused the color to assume a purplish shade. In the cases of nitric acid and ferric chloride this new color rapidly faded. Attention may again be directed to the fact that the cochineal insect feeds upon Opuntia vulgaris, and, considering this in connection with the above properties of the coloring matter, it seems at least barely possible that some relation may exist between this coloring matter and carminic acid. The author regrets that the time at her disposal was so limited as to preclude the investigation of this point.

For the purpose of investigating the proximate constituents of the fruit of Opuntia vulgaris, a supply was obtained from St. Petersburg, Fla. The material was collected from wild plants. When received the fruit was fully ripened and was still attached to the stem. Work was at once begun upon both parts. The seeds were not removed from the fleshy part of the fruit, but the latter taken in its entirety.

Proximate Analysis of the Fruit.—A quantity of the fruit was desiccated until sufficiently dry to admit being reduced to a No. 60 powder, into which state the fruit was brought before it was employed in this analysis. To estimate the moisture that yet remained in the powdered fruit, a weighed quantity was dried in an air bath to a constant weight at a temperature of 110° C. The loss was considered to be moisture; it amounted to 10·08 per cent. of the original weight taken. The dry residue from the above estimation of moisture was incinerated until all free carbon was consumed. The non-volatile residue of the inorganic constituents—or ash of the fruit—was found to equal 9·26 per cent. A qualitative analysis of this ash revealed the presence of potassium, calcium and magnesium in the forms of chlorides, sulphates, carbonates and phosphates.

Another weighed portion of the powdered fruit was treated with

solvents, in order to extract and separate the proximate principles contained therein. These solvents were applied in successive portions until they no longer exerted sufficient action to warrant their further application. After having been left in contact with it for the proper time, the solvents were removed from the undissolved powder. The successive portions of the same solvent were united as they were obtained from this treatment. In the cases of the petroleum ether, ether and absolute alcohol extracts, the whole bulk of liquid was distilled to dryness on a water bath, with the view of recovering the solvents and of obtaining the extracted matter in a form in which it could be weighed. Each of the three aqueous extracts was adjusted to a definite volume, and its contents of total solids determined by evaporating an aliquot part of the volume to a constant weight on a water bath. The residue so obtained was incinerated, in order to ascertain the amount of inorganic constituents, so that the deduction of their weight from the total solids would give the amount of organic solids. The ashes of petroleum ether, ether and absolute alcohol extracts are usually so slight that they were disregarded in this work. After the last portion of petroleum ether had been poured off from the undissolved powder, the latter was freed from the last traces of the solvent before the use of ether (which was the next solvent to be applied), by rotating the flask containing the powder on a hot water bath. This operation was repeated after the use of ether and of absolute alcohol, respectively. But, for obvious reasons, such a procedure was unnecessary after the treatment with water, alkaline water and acidulated water.

Petroleum ether removed extract to the extent of 2·16 per cent. This extract was semi-solid. It readily liquefied at the water bath temperature. The extract was treated with hot alcohol. This solvent made known the presence of a wax which was but sparingly soluble in it. Repeated treatment with hot alcohol finally dissolved the wax and left some caoutchouc.

Ether extracted from the fruit ·81 per cent. of brown, resinous substance, which had a slightly bitter taste. The extract was treated with water, slightly acidulated with sulphuric acid; this liquid dissolved one-half of it. Neither Mayer's reagent, potassium tri-iodide nor picric acid, when added to this solution, gave any evidence of alkaloids, nor did treatment with Fehling's solution, either before or after the boiling of the acidulated solution, serve to indi-

cate the presence of glucosides. Some of the acidulated solution was agitated with petroleum ether, ether and chloroform in succession, and subsequently rendered alkaline by the addition of ammonium hydrate, and again agitated with more of the same solvents in the same order; but, upon evaporation of the solvents, there was nothing obtained to indicate either alkaloids or glucosides. Nor could these principles be detected in 200 grammes of the stem which were examined in the same manner.

Hot alcohol was poured on the filter containing that part of the ether extract which was insoluble in acidulated water. This solvent dissolved about one-half of the filter's contents. The alcoholic solution gave, with ferric chloride, an olive-green precipitate, and with alcoholic solution of lead acetate a yellowish-brown precipitate. When some of the alcoholic solution was poured into water a turbidity was produced. The remaining fourth of the ether extract, which was not dissolved by either acidulated water or hot alcohol, was found to be soluble in an aqueous solution of potassium hydrate; and from its solution in that liquid the addition of diluted sulphuric acid in excess caused a precipitate of brownish-black substance.

Absolute alcohol dissolved 10·64 per cent. of the weight of the powdered fruit. The extract was of a blackish-red color, with a tinge of purple. It had an odor like that of prunes. It required prolonged drying at 110° C. before a constant weight was reached, and when this had been attained the extract was still of a semi-solid consistence. The process of drying did not affect the color or odor.

The extract was treated with water and the insoluble part filtered off. The filtrate had an acid reaction. With lead acetate it gave a whitish precipitate, while with ferric chloride but little change was observed, thus showing the absence of tannin from this extract. The tests for alkaloids and glucosides were attended with negative results.

To estimate the sugar in this and the other extracts, a quantity of the water solution of the extract was completely precipitated with lead acetate for the purpose of removing extractive matter, which otherwise might have interfered with the accuracy of the results. The mixture was filtered and the precipitate washed. The washings were added to the filtrate, and the latter saturated with

hydrogen sulphide to precipitate the excess of lead. The resulting lead sulphide was removed by filtration, the precipitate washed and the filtrate and washings warmed on a water bath to expel the excess of hydrogen sulphide—lead acetate paper being used to determine the complete expulsion of this gas. The liquid was then allowed to cool and afterward adjusted to a definite volume. One-half of this volume was made slightly alkaline with sodium hydrate, then warmed gently and filtered. The filtrate and washings of the filter were mixed with an equal volume of Fehling's solution, and then heated on a water-bath at the boiling point for twenty minutes. The cuprous oxide which had separated during this time was collected on a filter, washed with hot water until free from alkali and soluble copper compounds, then dried and converted into the more stable cupric oxide by igniting until a constant weight had been reached. The actual weight of glucose in the quantity of extract operated on was calculated by taking 45 per cent. of the weight of the cupric oxide and the percentage amount by simple proportion, of course, to the weight of the powdered fruit represented by the above quantity of extract. The amount of glucose found in the absolute alcohol extract was ·83 per cent. To determine the saccharose, it was inverted by boiling the other half volume with some diluted sulphuric acid for an hour, and, after allowing the solution to cool and making it alkaline, the determination was proceeded with as in the foregoing estimation of glucose.

From the whole quantity of glucose indicated by the weight of cupric oxide obtained, the previously determined quantity of glucose was deducted. Of the remainder, which represented the amonnt of glucose produced from the saccharose by inversion, 95 per cent. was taken as the amount of saccharose required to yield it, *i. e.*, the amount of saccharose present. Of this sugar 7·22 per cent. was found. That part of the extract which was undissolved by the water was found to be soluble in solution of potassium hydrate. When its solution in the latter solvent was acidified with diluted sulphuric acid, a brownish precipitate was produced. An alcoholic solution of some of that part of the extract which was undissolved by water gave, with alcoholic solution of lead acetate, a brown precipitate, and with ferric chloride a very slight precipitate.

The water extract of the powdered fruit amounted to 16·59 per cent. of organic solids. This amount included ·92 per cent. of glu-

cose and ·30 per cent. of saccharose. Neither gelatin and alum solution nor ferric chloride indicated the presence of tannin. A portion of the water extract was mixed with 4 volumes of absolute alcohol and set aside for twenty-four hours. The precipitate of mucilaginous and albuminous matter was collected on balanced filters, washed and dried. It equalled 3·76 per cent. of the weight of the powdered fruit.

When a weakly alkaline water was applied to the residue from the treatment of the powdered fruit with water and the other three solvents, 5·02 per cent. of organic matter was dissolved.

Some of this alkaline solution was made slightly acid with acetic acid, and then mixed with four volumes of absolute alcohol. The mucilaginous matter which was precipitated represented 2·35 per cent. of the fruit.

Water acidulated with hydrochloric acid removed 1·91 per cent. of organic solids. This acid solution did not contain phosphates. After the powdered fruit had been subjected to the action of all of the foregoing solvents in the cold, the remaining undissolved portion was washed free from hydrochloric acid, and then boiled for some minutes in water. The mixture was allowed to become cold, and a portion of the water tested with potassium tri-iodide for starch; but this substance was not found. The mixture was then filtered, and after the residue had been expressed to further rid it of water, it was dried, weighed, and finally incinerated. The weight of the ash obtained by this operation was deducted from the weight of the residue before incineration, in order to ascertain the amount of insoluble organic matter. The difference showed 37·07 per cent. of this substance.

The stem was found to contain 86 63 per cent. of water and ·21 per cent. of ash. The constituents of this ash were the same as those found in the ash of the fruit.

According to the "Food Products of American Indians," the fruit of Opuntia vulgaris is a favorite article of diet with this race of people. The tribes of the southwestern part of the United States call the fruit by the Spanish name, "tunis," which is more than probably derived from their use of the fruit of Tuna species. They dry great quantities of it for winter use. In gathering it they brush off the spines with a bunch of grass. The Apaches, however, use wooden tongs, or hooked sticks, to gather the fruit. The

Pawnees and Papagoes employ it in cooking meat, and, for this purpose, collect it while unripe, and allow it to dry. Then, again, the fresh unripe fruit is often boiled with water for ten or twelve hours, or until a product which has the appearance of stewed apples is obtained. This is then allowed to ferment, and, thereby becomes stimulating, as well as nutritious, and, owing to these properties, it frequently serves to sustain life in the absence of other food.

That the fruit of Opuntia vulgaris should find such an important economic use as that of a food is no matter of wonder when we consider the amounts of assimilable matter that it contains in the forms of mucilage, albuminoids, nutritious extractive matters and particularly its large percentage of sugars, and also its freedom from astringent and toxic principles. Its established popularity with the Indians is likely in greatest measure due to its acidulous, sweet pulp, which has been to them an incentive to collect it in spite of its defensive character.

On account of its formidable spines and fleshy, uninflammable nature, Opuntia vulgaris, like many other species of this genus, is used for hedges, especially along railroads. The use of the plant as a food for cattle is somewhat lessened by the spines, but these obstacles are removed by the cowboys with their bowie-knives or by throwing into a fire, whereby the spines are scorched to such an extent that they drop from the plant.

In Mexico the fruit of the various opuntias is known as *tuna*. They are regarded as possessing diuretic properties, and are employed for curing diarrhœa, while the juice is used in biliary affections. The flowers have the reputation of being useful in pectoral complaints.

For further details concerning the genus Opuntia, the following literature may be consulted:

1884. W. W. Light, AM. JOUR. PHAR., **56**, 3.
1888. *Kew Bulletin*, p. 170.
1891. Maisch, AM. JOUR. PHAR., **63**, 2.
1895. Mueller, *Select Extra-Tropical Plants*, 9th edition, p. 341.

Although there are several factories in the vicinity of New York devoted to the preparation of horse-meat for food, it is comfortable to be reassured by the chemist of the Board of Health that not an ounce of it is sold in this city, unless it be in the shape of imported sausage. It is also stated by these authorities that the flesh of the horse is easily detected by the usual iodine test for starch, which it contains in contradistinction to all other butchers' meat. —*Medical News*, February 8, 1896.

A PROXIMATE ANALYSIS OF POLYGALA SENEGA.

By J. Henry Schroeder.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy, No. 152.

The chemistry of Polygala Senega has been carefully elaborated by a number of previous investigators.[1]

The most important constituents and active principles have been pointed out, and the absence of a number of constituents has been proven. The results, however, still indicate that something is lacking; for in the absence of starch, tannin, inulin, and notable quantities of sugars, mucilage and pectin, the soluble constituents of the drug are not all accounted for. With this fact in mind, a preliminary investigation was undertaken by following Dragendorff's scheme, and then special extractions and estimations were made, with results to be given in the latter part of this contribution.

Petroleum ether extracted 5·62 per cent. of volatile and fixed oils. This residue, when heated in an air bath at a temperature of 110° C., was deprived of 0·12 per cent. of volatile oil; as has been pointed out by other investigators, this volatile oil is composed largely of methyl salicylate. L. Reuter pronounced the presence of 0·25–0·33 per cent. of methyl salicylate. The remaining fixed oil amounted to 5·50 per cent.; it was of a yellowish-brown color, neutral in reaction, and of a peculiar odor. It saponified in both aqueous and alcoholic potash solution; the specific gravity of the oil was approximately 0·936 at 25° C.

The concentrated ether extract represented 2·30 per cent. of the drug. Its color was slightly yellowish, and, when viewed under a lens, presented an oily appearance. Cold distilled water dissolved 0·16 per cent. of this extract; the aqueous solution readily reduced Fehling's solution. The test for alkaloids was applied with negative results.

The resinous extractive was entirely soluble in hot 95 per cent. alcohol, and amounted to 2·14 per cent.

Absolute alcohol extracted 6·56 per cent. of the drug; the result-

---

[1] 1804. Gehlen, *Berliner Jahresb.*, 112.
1836. Quevenne, *Journ. de Pharm.*, 22, 449.
1860. Procter, Am. Jour. Pharm., 32, 149.
1881. Goebel, Am. Jour. Pharm., 53, 321.
1889. Reuter, *Archiv der Pharm.*, 309 and 452.

ing extract was light brown in color, transparent, and had the characteristic odor of the drug. This residue was treated with several successive portions of cold distilled water; the aqueous solution was then tested for tannin with the following result:

Ferric chloride: brown color, no precipitate.

Bromine water: slight precipitate of a yellowish color.

Gelatin in presence of alum: cloudiness and very slight precipitate.

Freshly prepared lime water: yellow color, no precipitate.

Another portion of the aqueous solution was shaken out with acetic ether, until the latter remained colorless. The ethereal solution was evaporated on a water bath, and the residue treated with cold distilled water; a resinous white substance deposited. After warming the solution, the clear supernatant liquid gave the following reactions for tannin:

Ferric chloride: brown color, no precipitate.

Bromine water: yellow color, no precipitate.

Gelatin in presence of alum: cloudiness, no precipitate.

Freshly prepared lime water: yellow color, no precipitate.

These results indicate the absence of tannin in the drug.

The aqueous extract from the alcohol residue, after previous shaking out with acetic ether, was precipitated with neutral and basic lead acetate, the former producing a slight, the latter a copious precipitate, distinctly yellowish in color. The glucose present in the alcoholic extract amounted to 0·08 per cent., the saccharose to 0·50 per cent. Mayer's reagent gave no precipitate. The portion not dissolved by water was 5·98 per cent. This was probably largely composed of polygalic acid.

Cold distilled water extracted 14·02 per cent. of the drug. The infusion presented a frothy appearance. It contained 2·68 per cent. of glucose, and 5·32 per cent. of saccharose. On precipitating dextrin in the usual way, by absolute alcohol, it yielded only traces.

An attempt was made to remove the saponoid principle from this infusion by means of several methods.

A portion of the dilute infusion was shaken out with chloroform; although caution was exercised in shaking, it was almost impossible to separate the chloroform in a perfectly clear state, but it appeared frothy.

By slightly warming this chloroformic solution in a water bath, it

became clear, but, on cooling, it again became cloudy and frothy, and presented the appearance of a supersaturated solution of some saponoid principle. Upon recovering this chloroform by distillation on a water bath, there remained as residue a small amount of a yellowish, transparent substance, which did not froth with water, and was not affected by a drop of concentrated sulphuric acid.

Another portion of the aqueous extract was evaporated to a syrupy consistency on a water bath, this residue digested during about five minutes with boiling 95 per cent. alcohol, in several portions, until the washings remained colorless. On cooling, the mixed washings became opaque and deposited a sediment. The latter was treated with several portions of warm 95 per cent. alcohol, filtered, evaporated to small volume, and allowed to crystallize.

The residue consisted of microscopic crystals, of a yellowish tinge, a peculiar odor and a very acrid taste. A very small quantity produced with cold water a decided and permanent frothing. With sulphuric acid it produced a red color, gradually changing to a beautiful violet color. The amount was too small to permit of further purification.

Pectin and albuminoids, separated from the drug by dilute alkali, amounted to 18·40 per cent. This was found to consist almost entirely of albuminoids, and, as it is rather an unusually large percentage, it will be especially mentioned later in this paper.

The ash of the drug amounted, on an average of two estimations, to 6·65 per cent. It consisted of calcium, traces of potassium, with carbonic, phosphoric and sulphuric acids, and a small quantity of silica.

TABULATED RESULT OF PROXIMATE ANALYSIS OF SENEGA ROOT.

	Per Cent.	Per Cent.
Soluble in petroleum ether:		
Volatile oil	0·12	
Fixed oil	5·50	5·62
Soluble in concentrated ether:		
Resin	2·14	
Soluble in water	0·16	2·30
Soluble in absolute alcohol:		
Glucose	0·08	
Saccharose	0·50	
Impure polygalic acid and resin	5·98	6·56

	Per Cent.	Per Cent.
Soluble in cold distilled water:		
Glucose	2·68	
Saccharose	5·32	
Mucilage	1·95	
Extractive (saponin, etc.)	4·07	14·02
Soluble in alkaline water (0·1 per cent. NaOH):		
Pectin and albuminoids	18·40	
Extractive	2·16	20·56
Soluble in acid water (1 per cent. HCl):		
Pararabin		1·60
No starch.		
Lignin		11·60
Cellulose		19·30
Moisture		3·25
Ash		6·65
Loss		8·54
		100·00

On exhausting the drug (which had previously been percolated with acetone and freed from it) with cold distilled water, an infusion of a reddish-brown color was obtained, which was very frothy. After precipitating with basic lead acetate, I found 3·95 per cent. of glucose and 6·05 per cent. of saccharose. An attempt was made to secure the saponiod principle, with the same result as stated before.

In order to ascertain the character of the mucilage, pectin, etc., I made the following experiments:

About 100 grammes of the drug were exhausted with distilled water at ordinary temperature. The infusion was evaporated at low temperature on a water bath to about 150 c.c. The solution appeared very frothy. From this solution I precipitated the mucilage with five volumes of 95 per cent. alcohol. The mucilage was boiled, during two hours, with 1 per cent. sulphuric acid. A small amount of substance had precipitated out; the filtered liquid readily reduced Fehling's solution. It was then carefully neutralized by sodium hydrate solution, an excess of sodium acetate added, and then some phenyl-hydrazine-chloride, and the whole warmed on a water bath during half an hour. After standing twenty-four hours, lemon-yellow aggregates of an osazone had deposited. These were redissolved in cold 95 per cent. alcohol. On spontaneous evaporation, a small quantity of microscopic crystals had deposited.

After exhausting the drug with distilled water, it was treated with water, to which was added enough sodium hydrate solution to make the menstruum distinctly alkaline. Three macerations, of twenty-four hours each, practically exhausted the drug. The infusion had the appearance of an emulsion, due to the saponification of the fats and resins. It was evaporated at a very low temperature, on a water bath, acidified with acetic acid, and then precipitated with 5 volumes of 95 per cent. alcohol, resins and oil being held in solution. After draining, this precipitate was suspended in 1 per cent. solution of sulphuric acid, and boiled during two hours. The filtered liquid reduced Fehling's solution; with phenyl-hydrazine-acetate when treated as before, it formed only a slight precipitate of an osazone after twenty-four hours' standing. This indicated that only a small amount of the alkali portion consisted of pectin.

Lastly, the remaining drug was exhausted with boiling distilled water, evaporated as above, and precipitated with 95 per cent. alcohol; the precipitate was heavy and gelatinous. This was suspended in water containing 1 per cent. sulphuric acid, as before; after boiling, a residue remained undissolved. The filtered supernatant liquid reduced Fehling's solution readily, and gave a comparatively large amount of osazone when treated with phenyl-hydrazine-acetate.

The substance, which was not redissolved in the acidulated water, was found to be insoluble in all solvents tried, also in alkaline or acid solution.

In order to determine the amount of nitrogen in the drug, I estimated 1 gramme by the Kjeldahl method; the yield was 2·33 per cent. of nitrogen, corresponding to 14·56 per cent. of albuminoids, the factor employed being 6·25.

Thinking this to be a rather large amount, I made another estimation of 0·50 grammes by combustion with soda-lime. By this method I obtained 3·6 per cent. of nitrogen, corresponding to 22·50 per cent. of albuminoids. A second estimation yielded exactly the same amount.

With a view of determining whether or not this large amount of nitrogen could be due to the presence of asparagin, I made an examination for the latter by Dragendorff's method.

When the liquid was boiled with diluted HCl to decompose the asparagin, a heavy precipitate separated out. The supernatant

liquid was golden-yellow in color; on the addition of potassium hydrate solution, its color changed to a reddish shade. The precipitate was readily soluble in ammonia water, with a yellow color.

By this process I found only 0 62 per cent. of asparagin to be present. It will be seen in the first part of this contribution that the total amount of alkaline extractive represented 20·56 per cent. of the drug, and that 18·40 per cent. were precipitated as albuminoids and pectin, whereas the total amount of albuminoids, as calculated from the amount of nitrogen present, represented 22·50 per cent. Previous investigators have shown, however, that the albuminoids of senega are partly soluble in water, and it is, therefore, likely that a portion was extracted by the distilled water previous to maceration with alkaline water.

I beg to express my thanks to Professor Trimble for his many suggestions and valuable aid.

March, 1896.

THE COLORING MATTER OF THE ARIL OF CELASTRUS SCANDENS.[1]

By Ida A. Keller, Ph.D.

This paper contains the following general observations on the coloring matters of plants. The protoplasmic corpuscles have been appropriately designated *chromatophores.* It has been observed that, as a rule, yellow, orange and brown (sometimes blue) coloring matters are deposited in such chromatophores; while white, violet, blue and red (sometimes yellow) are usually caused by a solution of the pigment in the cell sap. It has been found desirable to make a distinction between the kinds of chromatophores. They are, for convenience, classified as follows: chloroplasts, chromoplasts and leucoplasts; the latter class, which are the colorless color bearers, being one of the contradictions in which the systems of human classifications abound. The bond of sympathy is, however, their common origin—the fact that one may be converted into the other, according to the conditions, and each one can originate only as a result of the division of pre-existing chromatophores.

---

[1] A paper read before the Botanical Section of the Academy of Natural Sciences of Philadelphia, and abstracted and condensed for the American Journal of Pharmacy. G. M. B.

Chloroplasts, as their name indicates, are the green bodies which impart the green color characteristic of leaves and stems. The pigment in this case can be readily extracted by means of such solvents as alcohol, ether and chloroform, while the matrix remains behind as definitely shaped, colorless masses of protoplasm. The pigment itself may, under the influence of various factors, external or internal, undergo modifications into chemically different substances, such as etiolin. Chloroplasts include all colored chromatophores not green. The distinction is quite an arbitrary one.

Chromoplasts may originate from leucoplasts or chloroplasts. The latter may easily be observed in the ripening of many fruits. The new substances resulting from this metamorphosis are not well known.

The red color of fruits undergoes change when preserved in 50 per cent. alcohol, due, no doubt, to oxidation of the pigment. Those of Ilex verticillata become brown; of Magnolia glauca, dark brown; of Lindera benzoin, almost black; of Berberis Thunbergii, light brown; of Cratægus coccinea, dark brown. In rare instances, however, the red color does not seem to be affected by alcohol, as, for example, the berry of Arisæma triphyllum and the aril of the seed of Celastrus scandens.

A microscopical and chemical examination of the latter was undertaken. The section showed the following anatomical structure: a very much thickened cuticle of a lemon-yellow color. This, without a doubt, affects the tint which has some yellow in it.

Courchet[2] states that the color of certain fruits is entirely due to the impregnation of pigment in such epidermal thickenings, and cites, as illustrations, Solanum macrocarpum and S. racemiflorum. The epidermis consists of a layer of small cells of a rather uniform size. The chromatophores within these are very conspicuous; they are bright red in color, and in form very narrowly spindle-shaped, and lie parallel to each other, being rather closely packed. Below the epidermis, the cells constituting the rest of the pulp of the aril are of larger dimensions, and the chromatophores seem to be irregularly scattered through the cells.

According to Zimmerman,[3] the pigments of chromatophores found

[2] "Recherches sur les chromoleucites," *Annales de Soc. Nat. Bot.*, Ser. VII, T. VII, 1888, p. 301.

[3] Zimmerman, "Botanical Microtechnique." Translated by James Ellis Humphrey, New York, 1893.

in phænogams, in regard to which we have little definite description, are as follows: (1) chlorophyll green; (2) carotin, including chlorophyll yellow; (3) xanthin; (4) coloring matter of Aloe flowers. Our knowledge of these, with the exception of chlorophyll, is uncertain. A formula is attempted only for carotin, which is said to be $C_{26}H_{38}$.

The great difficulty experienced in investigating these pigments is their unwillingness to crystallize. Carotin is the only one of these four which occurs within the cell in a crystalline shape, and which can be again crystallized when extracted from the plant.

Carotin is found as a crystalline secretion in the root of Daucus Carota, also in red flowers and fruits. It imparts a blood-red color to carbon bisulphide, in which it is readily soluble, and from which it may be obtained in the form of a crystalline precipitate by the addition of alcohol. I found that the pigment of the aril of Celastrus scandens was soluble in carbon bisulphide, forming a deep red solution, but no precipitate was visible on the addition of alcohol. After evaporation, an amorphous, sticky mass resulted, and it will thus be seen that it differs from carotin in this respect. The well-known solvents behaved as follows: water, no visible effect; alcohol, 50 per cent., no visible effect on the chromatophores, but the solution was slightly tinged yellow; alcohol, absolute, more soluble and the solution of a deeper tinge; ether, about like 50 per cent. alcohol, but a greater amount of yellow residue left on evaporation;[4] acetone, about like 50 per cent. alcohol; chloroform, much more soluble, solution deep red; carbon bisulphide, a deep red solution, similar to chloroform.

Carotin, according to Arnaud, is insoluble in water, almost so in alcohol, very slightly soluble in ether and most so in chloroform and carbon bisulphide. These solutions are colored yellow to orange-yellow, according to their degree of concentration, while the solution of carotin in carbon bisulphide is always blood red.[5]

Comparing this statement with what I have observed regarding the pigment under consideration, we find that there is a close similarity in reference to its solubility and that of carotin.

With concentrated sulphuric acid the chromatophore changed first to a greenish color and then to a decidedly purple-blue. This

---

[4] It is possible that the yellow matter, with which the cuticle is impregnated, influences, to some extent, the color imparted to solvents.

[5] Zimmerman, *Microtechnique*, p. 102.

same change of color was effected when concentrated sulphuric acid was added to the chloroform solution. With iodine solution in potassium iodide the chromatophores turn blue-green, like the color characteristic of the Cyanophyceæ. According to Zimmerman,[6] carotin thus treated yields a greenish or greenish-yellow color, and with concentrated sulphuric acid, first violet and then indigo-blue.

There is certainly much resemblance also between the effect of iodine and concentrated sulphuric acid upon carotin and upon the red pigment of Celastrus scandens.

Lacking, however, complete correspondence, I next determined to discover if it approached xanthin more closely in its properties. It differs from this in its most conspicuous, although on that account by no means most important property, and that is its color. Xanthin, as described by Zimmerman,[7] occurs in yellow chromoplasts in amorphous form, and especially in small granules. Its alcoholic solution leaves, on evaporation, a wholly amorphous resin-like mass. It is insoluble in water, little soluble in ether, chloroform and benzin, but more so in alcohol. With concentrated sulphuric acid the isolated pigment, as well as the chromoplasts, takes first a greenish, then a blue color; with iodine in potassium iodide it gives a green.

It will be seen from this that while the red pigment of Celastrus scandens differs from xanthin in its solubility, it agrees with it more closely in regard to the effect of sulphuric acid than it does with carotin. Another striking resemblance with xanthin is the resin-like amorphous residue left when the solvents are evaporated.

The coloring matter of Celastrus scandens is also remarkable for its resistance to the action of alkalies. Boiling with potassium hydroxide does not decompose it.

From the behavior of this coloring matter with solvents and other reagents, we must conclude that in it we find a connecting link between the crystallizing carotin of red flowers and fruits and the amorphous resin-like xanthin of yellow flowers, and these observations tend toward the confirmation of Courchet's views, that the pigments of yellow and red chromatophores, having the property of turning blue or green with sulphuric acid, thus distinguished from all other pigments, represent a group of closely related compounds, whose composition certainly demands further investigation.

---

[6] *Ibid.*

[7] *Ibid.*, p. 103.

DISTILLED WATER.

CINCINNATI, March 6, 1896.

Editor AMERICAN JOURNAL OF PHARMACY.

DEAR SIR:—In my article, "Distilled Water," this JOURNAL, January number, 1896, p. 1, is found the following passage:

"On determining the amount of this matter, it was found that 100·000 c.c. left 1·8 gramme of residue, which proved to be dissolved stone and constant. Tucker[1] gives the following limits of observed residues with glass condensers:

"100·000 parts of water left from 2·20 to 23·00 parts of residue."

It was an oversight to put in the words "with glass condensers," and thus inadvertently make Dr. Tucker responsible for the assertion that 100·000 parts of such distilled water contains 23·00 parts of solids. Dr. Tucker, in his paper, clearly states that most of the samples of water consisted of impure rain water or mere tap water.

My object in referring to the paper of Dr. Tucker was to show that my figure, giving the amount of residue (1·8 gramme) in 100·000 parts of water made with a stone still and worm, was lower than the lowest in the commercial samples analyzed by Dr. Tucker.

The reader of the paper would unquestionably perceive that Dr. Tucker could not have made so improbable an assertion as that 23·00 parts of solids could be present in 100·000 parts of official distilled water.

Dr. Tucker (according to private information kindly extended to me) regards 1 part of residue in 100·000 parts as the maximum amount in good distilled water, made with glass condensers.

Respectfully,

J. U. LLOYD.

PREPARATION OF LINIMENT OF SOFT SOAP.

BY C. E. SMITH.

This liniment may be made by a simple method, which accomplishes the formation of the soap and of the liniment at the same time, and gives, in addition, a product of more uniform strength than is possible by the older mode of preparation.

---

[1] "The Adulteration of Drugs." A lecture delivered before the Department of Chemistry of the Brooklyn Institute of Arts and Sciences, May 24, 1895, by Willis G. Tucker.

It consists in shaking a mixture of fixed oil, potassa solution and alcohol, until saponification has taken place, and then adding the remaining ingredients.

To make a liniment by this process, that will meet the Pharmacopœial requirements, the formula would be as follows:

Linseed oil	325 gms
Potassa	75 "
Oil of lavender	20 c.c.
Alcohol	300 "

Water, a sufficient quantity to make 1,000 c.c.

Dissolve the potassa in 200 c.c. of water; put the solution in a bottle of about 1,500 c.c. capacity, together with the linseed oil and the alcohol, and shake the mixture briskly from time to time, until there is no further separation of oil on standing. Let the solution stand in a moderately warm place for twenty-four hours, then dissolve in it the oil of lavender by agitation, and add enough water to make the product measure 1,000 c.c. Mix and filter.

The potassa should be neither stronger nor weaker than 90 per cent., unless allowance be made for the difference in strength.

The length of time required to finish the preparation depends upon the persistence with which the mixture is shaken at the beginning, but it can easily be done in two days, at least with quantities not much differing from those of the formula given above. Saponification can, of course, be hastened by heating the mixture, but the gain in time would be more than counterbalanced by the risk of vaporizing some of the alcohol.

Some of the constituents of oil of lavender being easily acted upon by caustic alkali, this oil should not be added until saponification is complete. About twenty-four hours time, after complete solution of the linseed oil, is required for this, when the liniment is made at the ordinary temperature.

Refined cottonseed or olive oil may be used instead of linseed oil, without changing the proportion of potassa, but these will usually give a liniment of lighter color than would be obtained from linseed oil.

BROOKLYN, N. Y., March 16, 1896.

The French War Office has ordered the use of aluminum drinking and mess vessels for the army, which are made without solder, being beaten up from plate. They resist the action of fire, foods and cooking liquids, which are not in contact with the metal for long periods.

ASSAY OF NUX VOMICA.

By C. E. Smith.

During several years' experience in assaying this drug and its preparations, a method has gradually developed, which is believed to have some advantages over the others now in use, so far as the writer is familiar with them. Its chief recommendations are that accurate results can be obtained by it without much practice, being quite simple, and that it requires no more time and attention than other methods, which are expected to give only approximate results.

The underlying principles made use of are well known, and have been used for similar purposes before, but the arrangement of details is the outcome of considerable practice, and a number of changes were found necessary or desirable before the process assumed its present form, in which it has now given uniform satisfaction for nearly two years. In one feature it is merely a modification of Keller's method, which apparently was not designed for highly accurate work, but intended only as a rough guide for the pharmacist.

The method to be described consists in exhausting the drug with weak acetic acid, evaporating the acid liquid to dryness, dissolving the extract in a very little alcohol and ammonia, then shaking this once with a large quantity of ether and chloroform, and finally titrating the separated alkaloids.

The following are the particulars :

Place 10 gms. of the powdered drug and 100 c.c. of 10 per cent. acetic acid into a bottle provided with a tight stopper, and shake frequently during twelve hours. Filter the acid solution and wash the residue on the filter with cold water until the washings are tasteless. Evaporate the solution in a shallow vessel to dryness on a water bath. While still warm, add to the extract 6 c.c. of a mixture consisting of equal volumes of strong alcohol and 10 per cent. ammonia water, and rub them together by means of a rubber-tipped glass rod, until a uniform thick syrup results. Transfer this to a separator containing 40 c.c. of ether and 45 c.c. of chloroform. Wash the extract still remaining in the evaporating dish into the separator with 6 c.c. more of the alcohol-ammonia, applying it in three or four successive portions. Cork the separator and shake vigorously for five minutes, then let it stand undisturbed for an hour. Filter the ether-chloroform solution through a small dry filter into a flask of about 200 c.c. capacity, washing the filter at the end with ether-chloroform. Distil off the solvent on a water bath, dissolve the alkaloids in a little alcohol with aid of heat, and add a few drops of methyl-orange or hæmatoxylin solution. Then dilute with water and titrate with decinormal acid.

The value of weak acetic acid in the extraction of alkaloids is being more and more recognized, and it is peculiarly applicable here, because it admits of using the drug in a coarsely divided state—the condition in which it is most readily obtained for assay—without risk of incomplete exhaustion. Moreover, it dissolves comparatively little coloring matter, excludes fats entirely, and can easily be gotten rid of by evaporation, without in the least injuring the alkaloids.

Alcohol and ammonia, in the proportions given, make the best solvent for the extract remaining after evaporating the acetic acid, and answer equally well, when the process is applied to the several alcoholic preparations of nux vomica. Only a little of this mixture is needed, and, by keeping the volume of the alkaloidal extract low at this stage, the next step of shaking out is much simplified, in that a single application of ether chloroform is sufficient to withdraw the alkaloids completely, any tendency to emulsify being entirely obviated at the same time.

A mixture of ether and chloroform is preferable to chloroform alone, as it enables the isolation of the alkaloids in a purer state. These still contain about 5 per cent. of impurities, however, making estimation by weight impracticable. But by titration quite accurate results are obtained, if the indicator used is fairly sensitive, and the endreaction is not materially obscured by the small quantity of coloring matter present.

The ether-chloroform solution may be drawn from the separator and filtered just as soon as the dark-colored extract has risen to the top, but in that case filtration will be very slow from clogging of the filter by small particles suspended in the solution. It is better to let it stand one or two hours, or over night, before filtering.

The method has been found equally useful as a means of standardizing the galenical preparations of this drug.

BROOKLYN, N. Y., March 16, 1896.

It has been definitely decided that the *British Pharmaceutical Conference* shall commence its sessions in Liverpool on Tuesday, July 28, 1896.—*Pharmaceutical Journal.*

A Three Months' Vacation by Our General Manager, is the title of a neat booklet, issued by the Smith, Kline and French Company, containing an account of what Mr. Kline saw in Europe during the summer of 1895.

BOTANICAL NOTES.

BY CLEMENT B. LOWE.

Contribution from the Botanical Laboratory of the Philadelphia College of Pharmacy.

STEM MARKINGS.

Attention is called to some interesting markings found on some stems of Magnolia, (species unknown) procured early in February.

An inspection of the axillary buds with the scars beneath them, caused by the detachment of the petioles of the leaves, will show that, taken together, they resemble in a remarkable manner the wrinkled face of an old man, surmounted by the kind of a head-dress worn by bishops and cardinals, known as the mitre.

The markings which look like eyes and nostrils were made by the vasal bundles, which ran from the stem into the petioles of the leaves, while the mitre is formed by the axillary bud.

A MONSTROSITY.

Through the courtesy of Mr. F. W. E. Stedem, a peculiarity in plant growth was recently placed in my possession. It was received by him from a gardener in Bucks County, Pennsylvania.

It is probably Anthemis nobilis. The stems, instead of being slender and about $\frac{1}{8}$ or $\frac{1}{16}$ of an inch in diameter, are flattened, and an inch or more in width. This peculiar development probably arose from the union in growth of a large number of the ordinary stems.

INDIAN ACONITE.

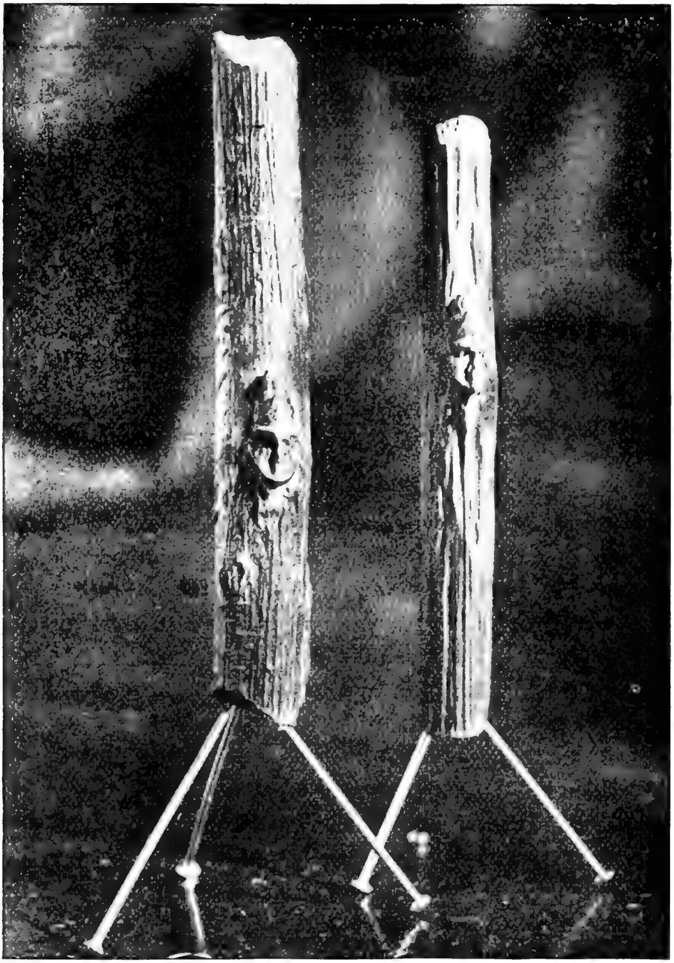
On examining some aconite purchased for cabinet specimens as Japanese aconite (Aconitum Fischeri, Reich), it was found to consist entirely of Indian aconite (Aconitum ferox, Wallich).

There is no necessity in confounding these drugs one with another, as they differ in a marked degree.

The Indian aconite, called also Bik or Bisk root, or Nepaul aconite is one of the largest of the aconites, often 4 inches long, and an inch or more in diameter. Externally it is prominently longitudinally wrinkled, of a somewhat reddish brown color, the edges of the folds being whitish, internally often horny, showing a five or six-rayed pith.

Japanese aconite is *much smaller*, 1 to 2 inches long, about $\frac{5}{8}$ of

an inch in diameter, somewhat elongated or napiform, of a uniform brown color, and but little wrinkled.



Leaf Scars on Stems of Magnolia.[1]

Internally it is white or mealy, and shows a roundish or about six-rayed pith, the vasal bundles being but few, and only slightly lignified.

---

[1] Credit is due Dr. Charles Schäffer for photographing these stems.

APOCYNUM ANDROSÆMIFOLIUM.

An inspection of a root purchased for the Botanical Laboratory of the College, as dogsbane (Apocynum androsæmifolium, Linné) showed it to consist entirely of Canadian hemp (Apocynum cannabinum, Linné).

This substitution, according to the National Dispensatory, frequently occurs, and need not be wondered at, as Apocynum cannabinum is the commoner of the two. Prof. Bastin states having seen many acres of our Western plains covered with it.

In talking with a representative of a drug house in this city, from whom I procured what was represented to be dogsbane root, he said it was the only kind kept by them, which he said they sold indiscriminately for either species. On investigation, I found it to be Canadian hemp root.

These roots resemble each other so closely that the difference between them is difficult to determine by even a careful inspection, and yet they differ somewhat in medicinal properties, the A. cannabinum being the more active of the two.

A quick method of examination, that does not necessitate the use of a compound microscope, is to make a neat section with a penknife and apply the phloroglucin test, when the groups of lignified stone cells (not bast cells, as described by Manheimer in the AMER. JOUR. PHAR., 1881, p. 554) will stain red, and can be readily seen by a magnifier.

LABORATORY NOTES ON OIL OF CASSIA, ELM BARK, IPECAC ROOT, POTASSIUM IODIDE, REDUCED IRON AND SAFFRON.

By LYMAN F. KEBLER.

In many minds lingers the erroneous idea that goods contained in original packages, coming from apparently ignorant producers, must be pure. Thus "country beeswax" cannot be adulterated because the bee-keeper is not versed in the art of sophistication; the Chinese are too ignorant to adulterate oil of cassia, etc. That this idea is false and misleading will be supported by many analysts, and corroborated by some of the following results. The data recorded below were obtained from material procured directly from the producers or their agents, and represent the articles as supplied to the wholesale drug trade in general.

OIL OF CASSIA.

As is well known, this substance is produced in the Orient, and is practically controlled by the Chinese. That it is occasionally found adulterated in original containers is not new to many, but the crudeness of the adulterations is known to a smaller number. In general, the U. S. P. requirements are satisfactory for detecting fraudulent goods, but whenever it is possible the percent. of cinnamic aldehyde should always be estimated. In order to do this, it is necessary to be in possession of a glass flask, about 100 cubic centimetres capacity, with a neck about 13 centimetres long, 8 millimetres internal diameter and graduated in tenths up to 6 cubic centimetres. It is impossible to obtain this flask from dealers in this country at present, but it can readily be secured from Messrs. Schimmel & Co., of essential oil fame.

To estimate the aldehyde in a sample of oil, proceed as follows:[1] into the long-necked flask measure exactly 10 cubic centimetres of the oil; warm the flask and contents well on a water bath, add about 20 cubic centimetres of a 30 per cent. sodium bisulphite solution—a curdy mass results almost immediately—agitate the mixture thoroughly several times, carefully avoiding loss by squirting. The flask is then placed on a hot water bath, and heated until the coagulum has assumed a perfectly fluid state. Add another small portion of the sodium bisulphite solution, shake, and warm on the water bath as before. Proceed in this manner until the flask is about three-fourths filled, the coagulum is completely dissolved and a clear layer of oil floats on the solution. Not a speck of curd must be visible. Remove the flask from the water bath, cool, and fill up the flask with the bisulphite solution or a saturated solution of salt until the oil has completely risen into the neck, and the line of demarcation coincides exactly with the lowest mark on the neck of the flask. The oily portion represents the non-aldehydes, excepting the cinnamic acid which is dissolved by the aqueous solution, contained in the oil. On deducting the number of cubic centimetres of the oily substance from ten, and multiplying the remainder by ten, we obtain the percent. of aldehyde in the oil.

With a pure oil the estimation can be made in one-half an hour, and never more than two hours should be consumed. With an

[1] 1890, Semi-annual Report, Schimmel & Co., Oct., page 15, and 1891, Oct., page 15; 1892, Odorographia, by J. C. Sawer, Vol. I, page 216.

adulterated oil the time is much extended, varying with the amount and nature of the adulterant.

The process yields only approximate results. Duplicates vary from each other as much as 2 per cent.

The following table contains the analytical results obtained from six samples of oil of cassia:

No.	Sp. Gr. at 15° C.	Per Cent. of Aldehyde.	Solubility in 70 Per Cent. Alcohol.	Solubility in Alcohol.	Reaction with Lead Acetate.	Rendered Turbid at	Per Cent. of Residue.
1	1·0566	79·5	Soluble.	Soluble.	None.	—	6·23
2	1·0692	64·0	Soluble.	Soluble.	None.	—	9·84
3	1·0452	56·0	Insoluble.	Soluble.	Precipitate.	18° C.	12·71
4	1·0490	64·0	Insoluble.	Soluble.	Precipitate.	12° C.	13·61
5	1·0428	54·0	Insoluble.	Soluble.	Precipitate.	20° C.	12·87
6	1·0062	40·0	Insoluble.	{Insoluble in equal parts.}	Precipitate.	—	—
7	0·8168	—	Insoluble.	Insoluble.	None.	8° C.	—

No. 1 was obtained from a well-known house, and guaranteed to be pure. No. 2 proved pure according to the U. S. P. requirements, but contained a low percentage of aldehyde. Nos. 3, 4 and 5 were taken from three original containers selected from one consignment. The containers were sealed and marked Yan Loong, which usually represents a high-grade oil. No. 6 was a known mixture of oils of cassia, rosin and copaiba. This mixture was made to test the accuracy of the aldehyde process in the presence of these substances. They did not vitiate the results. No. 7 was petroleum oil, obtained from one of the containers, having been added in excess of saturation.

The residue in all samples except No. 1 was excessive and hard to brittleness. The normal residue varies from 5 to 8 per cent., and is soft, never hard. Ten per cent. is allowable in extreme cases.

ELM BARK.

That elm bark does contain starch has been clearly proven by Professor Lloyd.[1] Exactly what it is that interferes with the ordinary starch test is not known. It is even impossible to detect the starchy matter with certainty, with the aid of a microscope magni-

[1] 1895, AM. JOUR. PHARM., 67, 459.

fying 600 diameters, but an addition of starch is immediately revealed by this instrument. The percentage of ash forms a very good basis from which to draw conclusions. That our markets are not free from adulterated elm barks the following analysis will show:

No.	Per Cent. of Ash.	Starch per Microscope.	Color per Lloyd's Test in 5 Minutes.	Color per Lloyd's Test in 1 Hour.	Body of a 1 Per Cent. Mucilage.
1	7·88	None.	Faint blue.	Blue.	Moderate.
2	7·14	None.	Faint greenish-blue.	Blue.	Heavy.
3	3·65	Abundance.	Dark blue.	Black.	Moderate.
4	3·10	Abundance.	Dark blue.	Black.	Moderate.
5	7·68	None.	Decided blue.	Blue.	Light.
6	7·21	None.	Faint greenish-blue.	Blue.	Heavy.

The adulterant of Nos. 3 and 4 was wheat starch, which, according to the percent. of ash, amounted to about 50 per cent. The per cent. of ash runs a little lower than that recorded by Professor Lloyd for a good bark, but the time of gathering may easily account for this. The percent. of ash as recorded above is based on the samples as received, without drying.

In the writer's experience the test for starch will be more satisfactory if the test tubes are set aside for some time to allow the suspended matter to subside. The mixture above the subsided matter will then show a distinct blue.

IPECAC ROOT.

This drug, for the past year, has been of a very satisfactory quality. A number of samples examined during the past six months yielded by titration, with volumetric acid solution, the following percentages of alkaloids: 2·10, 2·64, 2·35, 2·36, 2·26, 2·65, 2·43, 2·45, 2·54, 2·65, 2·10, 2·13, 2·45, 2·11, 2·41 and 2·43. This is not an isolated case. Data for a number of other drugs could easily be added that would represent an equally good showing.

POTASSIUM IODIDE.

Notwithstanding the high price of this article, there exists very little in the channels of trade that complies strictly with the U. S. P. requirements. Not only is this true of the commercial product, but some of the so-called chemically pure material is also found

wanting. Some of the best manufacturers maintain that the official requirements are too rigid for a medicinal product. In this opinion the writer concurs with them in a measure, but the chemically pure substance certainly ought to comply with these requirements. That the Pharmacopœia is practically disregarded in the manufacture of this chemical, the table below clearly shows:

No.	Alkalies.	Sulphates.	Iodates.	Sodium.
1	Excess.	Present.	Absent.	Absent.
2	Excess.	Present.	Present.	Present.
3	Normal.	Present.	Absent.	Absent.
4	Normal.	Present.	Absent.	Absent.
5	Normal.	Present.	Absent.	Present.
6	Normal.	Absent.	Absent.	Present.
7	Normal.	Absent.	Present.	Present.
8	Normal.	Present.	Absent.	Present.
9	Excess.	Present.	Absent.	Absent.
10	Excess.	Present.	Absent.	Absent.
11	Excess.	Present.	Absent.	Absent.
12	Normal.	Absent.	Present.	Absent.

A trace of free iodine was present in No 7. No other impurities excepting those mentioned in the table above were present. Even the percent. of potassium iodide was normal.

The writer desires to call attention to an inconsistency that exists in the U. S. P. requirements for testing potassium iodide. A limited amount of alkali is admissible. This alkali is always present as a carbonate. The test for sulphates reads as follows: "The aqueous solution should remain clear after the addition of barium chloride T. S. (absence of sulphates)."

An article containing the limit of alkali will always indicate the presence of a sulphate under these conditions, whether the latter is present or not. The requirement should read: "The aqueous solution acidulated with hydrochloric acid should not be rendered turbid after adding, etc."

REDUCED IRON.

In examining these samples, the directions of the Pharmacopœia were followed, except that the mixture of mercuric chloride and iron were heated one and a half hours instead of one hour, to ensure a

complete chemical reaction. As a second precaution, the percent. of iron in a sample of steel filings and a sample of wrought iron filings were estimated simultaneously by the same process in the same bath. The following results were obtained:

No.	Color.	Residue.	Metallic Iron.	Sulphides.	Arsenic.	Reaction.
1	Grayish-black.	1·12	52·65	Trace.	Trace.	Neutral.
2	Gray.	0·45	84·34	Trace.	Trace.	Neutral.
3	Black.	2·36	38·60	Trace.	Trace.	Neutral.
4	Gray.	1·48	78·97	None.	Trace.	Neutral.
5	Gray.	1·83	76·05	None.	Trace.	Neutral.
6	Gray.	0·95	81·90	Trace.	Trace.	Neutral.
7	—	2·21	97·11	Trace.	Excess.	Neutral.
8	—	1·01	91·26	Trace.	Excess.	Neutral.

Nos. 7 and 8 represent the iron filings. They were No. 80 powder, that is a little coarser than reduced iron generally, consequently they were less readily acted on by the mercuric chloride. This and the hardness probably account for the lower percent. of iron in No. 8, which was steel.

SAFFRON.

For an exhaustive study on the examination of this drug the writer can do no better than to refer the reader to an excellent article by the late Prof. Maisch.[1] Saffron appears to retain its reputation as being largely adulterated. Of the seventeen samples of Spanish saffron examined during the past few years, five were weighted with barium sulphate, three contained added coloring matter, in one of these at least ten per cent. of the yellow filaments were included, one contained fibres resembling fine "excelsior" broken up and dyed, while the remaining eight were pure. Some of the samples contained rather too many yellow styles, not sufficient to pronounce the article adulterated, but a sufficient number to make it quite profitable to the producer to have them there. Even 1 or 2 per cent. would be quite an item with such an expensive drug.

As regards added coloring matter, a word may not be amiss. On adding benzin to a freshly received sample, a decided yellow color was imparted to the former. On adding the benzin to an air-dried sample in the laboratory, no coloration was produced. A sample

[1] 1885, AM. J. PHARM., **52**, 487.

procured from Prof. Bastin also proved free from added coloring matter. This was also air-dried. Thinking that there might be a difference on adding the benzin to air-dried material and the samples as received, the sample that indicated added coloring matter was also dried and the test applied again. The coloring was again indicated, but less pronouncedly and less promptly. Different fractions of the benzin were also tried with the same results. Benzin containing fractions varying from 35° C. to 90° C. is just as applicable for this test as the fraction between 50° and 60° C., required by the U. S. P.

In concluding this paper, the writer wishes to state as his experience that drugs and chemicals are less frequently intentionally sophisticated than that they fall a trifle below the standard of purity.

305 Cherry Street.

A CONTRIBUTION TO THE KNOWLEDGE OF SOME NORTH AMERICAN CONIFERÆ.

By Edson S. Bastin and Henry Trimble.

(*Continued from page 140.*)

PINUS ECHINATA, MILLER.

PINUS MITIS, MICHAUX.

SHORT-LEAF PINE, YELLOW PINE.

GENERAL CHARACTERS.

The yellow pine is a fine, straight-boled tree, attaining a diameter at the base of about 2 feet, and a height of from 50 to 100 feet. Its wood is fine-grained, moderately resinous and durable.

It is found occasionally as far north as Massachusetts, but is more common farther south, from New Jersey to South Carolina and Florida, and along the Gulf States westward as far as Texas. It also occurs in Pennsylvania, east Tennessee, southern Indiana, southeastern Kansas and Arkansas, but is more abundant toward the coast. It occurs in greatest abundance in dry or sandy soils, but is found also in the more fertile ones, where, however, it attains a larger size.

Its branches are smoothish ; its leaves in twos, except on thrifty shoots, where they are frequently in threes, from 3 to 5 inches long,

rather slender, often concave on the inner face, deep green, and conspicuously sheathed at their base by sheaths which attain a length of half an inch or more; its cones are rather persistent, ovate, 1½ to 2 inches long, and with the thickened scales tipped with a minute, weak prickle.

MICROSCOPIC STRUCTURE.

A cross-section of the leaf showed usually one convex and one concave or flat side; the excessively thick-walled epidermal cells

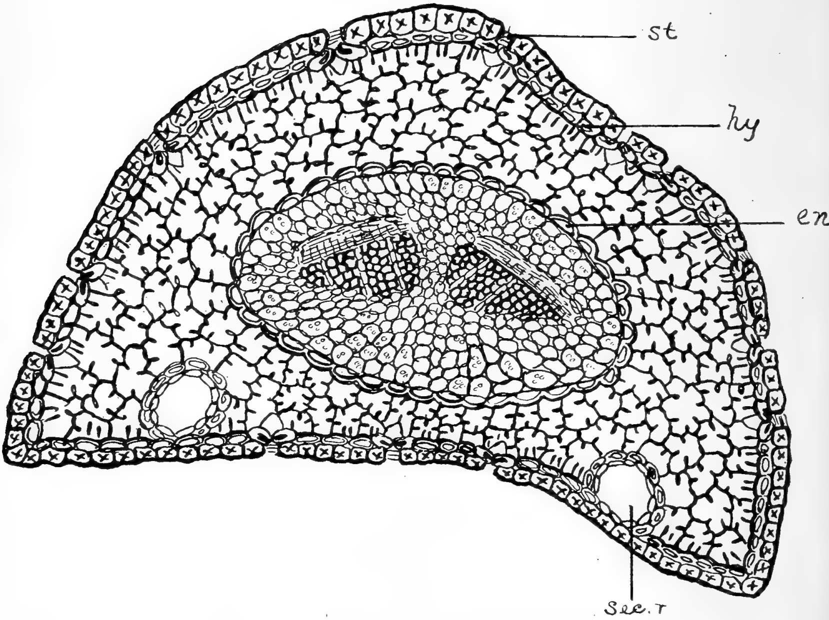


Fig. 17, cross-section of the leaf of Pinus echinata, magnified 100 diameters. *St*, stoma; *hy*, hypoderma; *en*, endodermis; *sec. r*, secretion reservoir.

were of rather large size, and strengthened beneath by a single-layered hypoderma composed of cells that were only moderately thick-walled. The secretion reservoirs, usually two in number, were of large size, strengthened by a circle of moderately thick-walled cells, and located contiguously to the hypoderma on the inner face of the leaf, at a little distance from the angles.

The mesophyll was of the usual folded walled variety. The endodermis had the exterior wall of its cells decidedly thickened. The

transfusion tissue was of the usual character, and the bundles which it enclosed were each about two- or three-rayed.

There were, on the outer or convex surface of the leaf, from ten to fourteen rows of stomata, and on the concave or inner surface from five to seven rows.

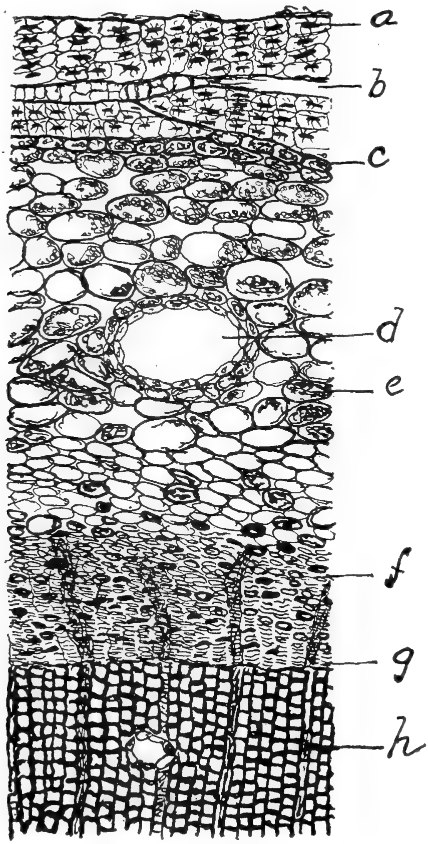


Fig. 18, portion of cross-section of stem of Pinus echinata, magnified 100 diameters. *A*, stone cells of periderm layer; *b*, fissure; *c*, phellogen layer, rich in tannic matters; *d*, secretion reservoir in cortex; *e*, tannin cell; *f*, bast layer, containing secretion cells; *g*, cambium; *h*, medullary ray in wood.

A cross-section of a twig of three years' growth showed the following structure: At the outside, a periderm composed of bands of stony tissue alternating with bands of thin-walled cells, which were succeeded interiorly by a phellogen layer rich in tannic matters; inter-

ior to this a cortical parenchyma of considerable thickness, destitute of lignified elements and composed of thin-walled cells of large diameter, mostly elongated in a tangential direction. This portion was observed to be rich in both tannic and resinous matters, and to contain secretion reservoirs and lacunæ of the usual character. The bast layer was also destitute of lignified elements, was for the most part small-celled, contained in its outer layers much crowded and collapsed sieve-tissue, and was sprinkled throughout freely with secretion cells of larger diameter, which contained tannic and oleoresinous matters. The medullary rays which cross the bast layer were especially rich in oleoresin, which was also abundant in the medullary rays of the wood. The tracheids of the wood contained it to some extent. Tannic and oleoresinous matters were also abundant in the pith.

The microscopic study indicated that the inner bark of this species is somewhat less rich in tannic matters than most of the others examined, though the difference is not great.

CHEMICAL COMPOSITION.

The resinous products of the short-leaf pine are by far the most important constituents.

For the purposes of the present contribution, the moisture, ash and tannin of two samples were estimated. One of these was the thick, corky bark of a full-grown tree from Alabama, obtained through Dr. Charles Mohr; the other was the bark of a younger tree, obtained from Mr. Frank Bassett, of Hammonton, New Jersey. Both were collected about December 1, 1895.

	Specimen from Alabama. Per Cent.	Specimen from New Jersey. Per Cent.
Moisture	9·17	8·22
Ash in absolutely dry bark	1·32	1·52
Tannin in absolutely dry bark	18·19	11·26

The percentage of tannin in the Alabama specimen is, no doubt, too high, as it was associated with considerable coloring matter, which, with our present method of tannin estimation, is unavoidably retained by the hide powder and recorded as tannin.

ECONOMICS.

This pine figures somewhat in the turpentine industry. According to W. W. Ashe,[1] there were 3,000 boxes of short-leaf pine cut in

[1] 1894, "The Forests, Forest Lands and Forest Products of Eastern North Carolina." Bulletin No. 5, North Carolina Geological Survey.

one county of North Carolina in 1893; no doubt considerable quantities in other sections. The young trees are the only ones which yield sufficiently to justify boxing; they yield about two-thirds as much turpentine as the long-leaf pine, and can be worked from six to seven years.

The lumber of this tree, while not held in the esteem possessed by the long-leaf pine, is, nevertheless, justly popular. The wood is fine-grained and when devoid of the sap or outer portion, is remarkably durable. It is used largely in ship-building, especially for masts, spars, etc.

PINUS TAEDA, LINNÉ.

LOBLOLLY PINE, OLD FIELD PINE, FRANKINCENSE PINE.

GENERAL CHARACTERS.

The habitat of the loblolly pine is southerly, extending from Florida northward to southern New Jersey and Delaware, and westward as far as Texas and Arkansas. It is most abundant in the coast region, and affects both wet clay and dry sandy soils. When growing in the former it often attains a height of 100 feet or more, and produces a valuable timber; but in dry soils it forms mostly a low, profusely branching tree, whose wood is not durable, being liable to become worm-eaten and rotten. The bark is blackish-gray, rough, and on old trunks much fissured. The male flowers are densely massed, cylindrical, 1½ to 2 inches long, with from ten to thirteen involucral scales. The cones are elongated, somewhat pyramidal, deflexed, 3 to 5 inches long, of rather loose texture, not hard, and not long persisting on the tree after shedding their seeds. The scales are tipped with a stout incurved spine. The seeds have three roughened ridges on the under side.

The leaves are mostly in threes, sometimes in twos, 6 to 10 inches long, light green, with a close sheath about ½ inch long at the base. On each of the two flat surfaces are from four to six rows of stomata, and on the convex one from nine to twelve rows.

MICROSCOPICAL STRUCTURE.

A cross-section showed the following structure: Beneath the thick-walled epidermis was a two-layered hypoderma, the exterior layer of which was composed of cells with but moderately thickened walls, while those of the inner layer were excessively thickened. The mesophyll did not differ markedly from that of other

species of pines. The resin ducts, usually one opposite each angle of the leaf, and often one opposite the middle of the convex side, were buried in the mesophyll nearly midway between the endodermis and hypoderma, and each was usually bounded by a strengthening layer of thick-walled cells. Endodermis with cell walls scarcely thickened, except the radial walls, which were somewhat so; transfusion tissue of the usual pitted variety, enclosing two diverging bundles, each crossed by two or three medullary rays. Buried in the transfusion tissue, between the outer ends of the phloem of the two bundles, were a few thick-walled fibres, and a few were also

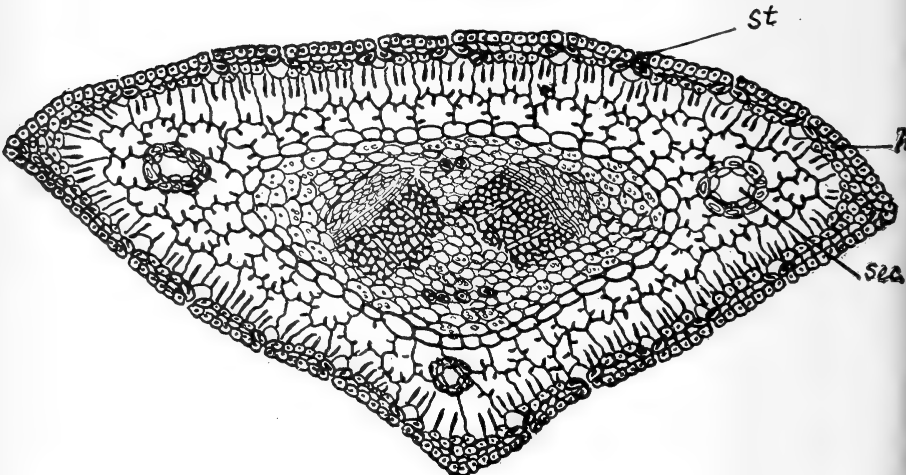


Fig. 19, transverse section of leaf of Pinus Taeda, magnified 100 diameters. *St*, stoma; *b*, a cell of the outer of the two layers of the hypoderma; *sec. r*, secretion reservoir.

found between the inner ends of the xylem masses of the two bundles. The mesophyll cells were observed to contain tannin in abundance, in this respect resembling all the other species examined.

A transverse section of a twig of two years' growth showed the following structure: An epidermis composed of small but very thick-walled cells, supported interiorly by several layers of cells with excessively thickened walls. These were succeeded interiorly by several layers of rather large, thin-walled cells, next to which occurred another zone of very thick-walled cells, apparently an

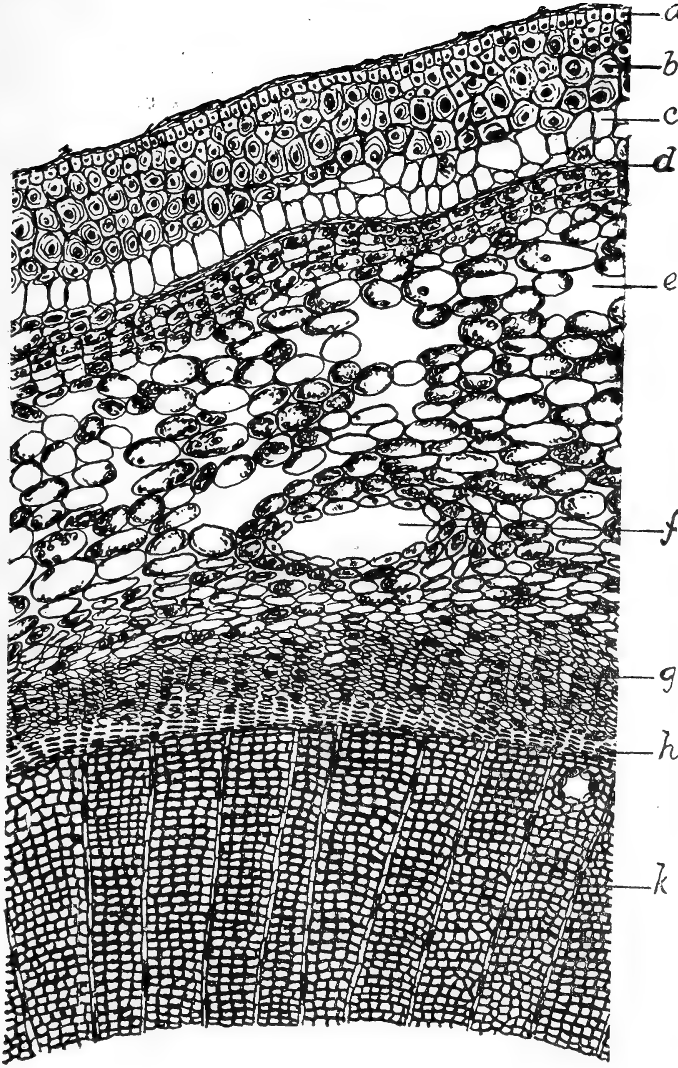


Fig. 20, portion of transverse section of a twig of two years' growth of Pinus Taeda, magnified 100 diameters. *A*, epidermis; *b*, sclerotic strengthening cells beneath the epidermis; *c*, layer of thin-walled parenchyma; *d*, thick-walled cells of periderm; *e*, lacuna; *f*, secretion reservoir in cortex; *g*, bast layer; *h*, cambium; *k*, tracheids of the xylem.

internal periderm. Adjoining these on the interior were two or three layers of thin-walled cells arranged in radial rows. These were succeeded by a considerable thickness of large-celled parenchyma, containing lacunæ filled with air, scattered secretion reservoirs of the usual kind in pines, a few crystal cells and numerous scattered tannin and oleoresin cells, but no lignified cells. The bast layer, also destitute of lignified elements, was small-celled, with the cells generally arranged in radial rows. Secretion cells containing tannic and oleoresinous matters were abundant in this layer, but less conspicuous in size than those of the last-described species. The cambium and wood possessed no marked peculiarities. The pith was composed of both thin-walled parenchyma and sclerotic cells, and many of the parenchyma cells were heavily charged with tannic and oleoresinous matters.

The kind and distribution of tannin in this species agreed closely with that in the other species described. It was, however, richer than most, except P. palustris, in oleoresinous matters, these abounding not only in the secretion reservoirs, but also in the parenchyma of the middle and inner bark, in the medullary rays, in the pith and in the tracheids.

CHEMICAL COMPOSITION.

The tannin, moisture and ash were estimated in a specimen of the bark of the loblolly pine collected near Atlanta, Ga., October, 1895, with the following results:

	Per Cent.
Moisture	9·55
Ash in absolutely dry bark	1·19
Tannin in absolutely dry bark	12·55

ECONOMICS.

The loblolly pine is considerably tapped for turpentine, although it does not yield this product as profitably as does the long-leaf pine. With the increasing scarcity of pine lumber, this tree is looked on with more favor than formerly. While its lumber decays rapidly when exposed to the weather, yet it is the only building and fencing material in numerous large sections of the Southern United States. When used for indoor work it lasts well, and compares favorably with other pine lumber.

PINUS CUBENSIS, GRIESBACH.

CUBAN PINE, SLASH PINE, BASTARD PINE, SWAMP PINE.

GENERAL CHARACTERS.

This pine occurs on our southern borders from South Carolina to the Florida Keys, and westward to Louisiana; it is also found in the West Indies. It grows in sandy or wet soil, and does not occur far from the coast. It attains a height of from 80 to 100 feet and a diameter at the base of from 2 to 3 feet, and has a laminated, reddish-brown bark. The staminate flowers are from 1½ to 2 inches long, many in a head, and each subtended by an involucre of about twelve bracts. The cones are mostly in clusters of from two to four, long-conical, 4 or 5 inches long, brown, the thickened scales armed with a short and usually stout, but sometimes rather slender prickle.

Its wood is heavy, tough, resinous, with rather small secretion reservoirs, compact and durable.

The leaves of the Cuban pine are in twos or threes, about 9 or 10 inches long, rounded on the outer and flattish on the inner surface, and subtended at the base by a prominent sheath about ½ inch in length. The stomata are in about six rows on the flat, and in from eleven to thirteen on the rounded surface.

MICROSCOPICAL STRUCTURE.

A cross section of the leaf showed an epidermis of very thick-walled cells, supported by a two-layered hypoderma, the outer layer of which was made up of cells with but slightly thickened walls, while the inner was composed of very thick-walled cells. The mesophyll, which abounds in tannic matters, presented no special peculiarities.

The secretion reservoirs were from four to six in number, located in the mesophyll, rather nearer the endodermis than the hypoderma, and those nearest the angles of the leaf were the largest. The sheathing cells had walls which were but slightly thickened. The conspicuous endodermis had only its radial walls perceptibly thickened. The transfusion tissue, which presented the usual structure and arrangement of its cells, surrounds two diverging bundles, each about four-rayed.

The cells between the inner ends of the xylem masses were very loosely arranged, showing lacunæ of considerable size. Occasional thick-walled fibres were recognizable at the outer ends of the

phloem masses, and a few were seen also opposite the xylem ends of the bundles, about midway between them and the endodermis.

The cross-section of a twig of two years' growth showed the following structure: At the exterior, a periderm consisting of thickish-walled cells, which contained abundance of tannic and coloring matters; interior to this, a zone consisting of several thicknesses of cells, whose walls were excessively thickened and lignified; succeeding this, a phellogen layer rich in tannin; next, a thick, cortical parenchyma, composed chiefly of large, thin-walled cells, elongated in a tangential direction, but interspersed with secretion reservoirs, and containing also a few scattered stone cells; a bast layer, composed of

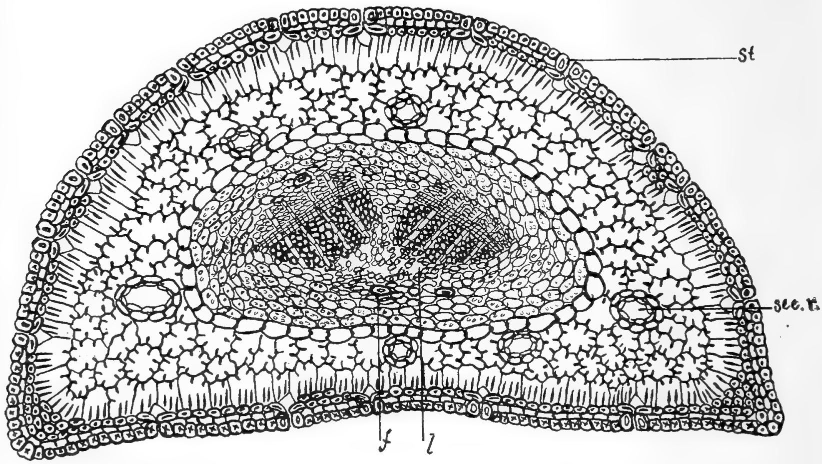


Fig. 21, transverse section of leaf of Pinus Cubensis, magnified 75 diameters. *St*, stoma; *sec. r*, secretion reservoir; *f*, sclerenchyma fibre; *l*, lacuna.

relatively small cells, and destitute of fibrous or other lignified elements, having its tissues mostly arranged in radial rows and interspersed with small secretion cells; a cambium zone, which presented no special peculiarities; a zone of xylem tissues, whose structure resembled that of the other species of its genus; and a pith composed chiefly of thin-walled parenchyma, containing numerous secretion cells.

The tannin was similar in distribution to that in Pinus Taeda, and the oleoresinous matters were also similarly distributed, though they appeared to be somewhat less abundant in the specimens studied.

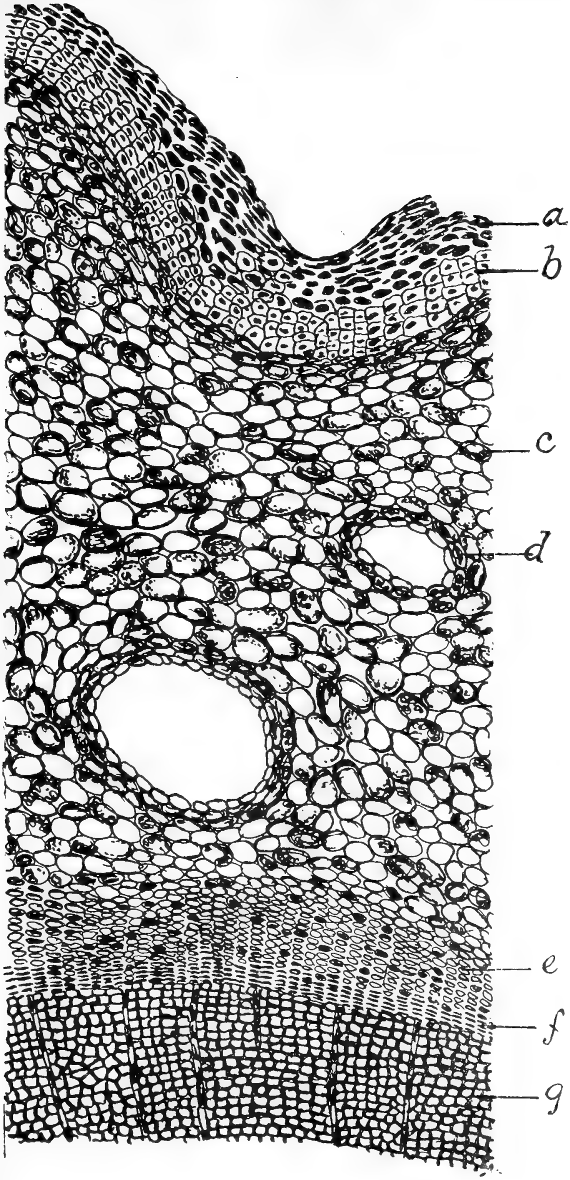


Fig. 22, portion of cross-section of stem of two years' growth of Pinus Cubensis, magnified 100 diameters. *A*, disintegrating tissues at exterior; *b*, sclerotic cells of periderm; *c*, tannin cell of cortex; *d*, secretion reservoir in cortex; *e*, bast layer; *f*, cambium; *g*, tracheids of secondary xylem.

The figures of the cross-sections of the stems of these three species, if compared, will show how similar they are as respects the distribution of tannin, for all of these drawings were made from sections which had been cut from the fresh stem and immediately placed in a freshly prepared solution of anhydrous ferric chloride in absolute alcohol.

CHEMICAL COMPOSITION.

A specimen of bark of Cuban pine, received from Dr. Mohr, of Alabama, collected in December, 1895, yielded the following percentages of moisture, ash and tannin:

	Per Cent.
Moisture	9·04
Ash in absolutely dry bark	0·72
Tannin in absolutely dry bark	1·36

Evidently this species will never be of any value on account of its tannin. It is probable that a specimen from a younger tree would yield more of the astringent principle, as the bark investigated consisted largely of cork. But in any event, the bark of this species is very poor in tannin.

The resin of this and the loblolly pine is more fluid than that in the long-leaf pine, and, therefore, yields a larger proportion of spirit of turpentine, with a corresponding decrease in the amount of resin.

ECONOMICS.

This is one of the three species which yield the great bulk of the turpentine of the South, although the amount obtained from Cuban pine is far below that from the long-leaf pine. The wood is used to a limited extent for lumber.

[*To be continued.*]

NOTES ON THE RECENT LITERATURE OF BOTANY AND MATERIA MEDICA.

By George M. Beringer.

Index Kewensis. This voluminous work, rendered possible only by the munificence and forethought of Mr. Darwin, has been recently completed by the botanists of Kew. It is not only a list of plant names, indicating in each case the family to which the plant has been assigned, but is a bibliographical index of descriptions

and authorities down to the year 1885, and is, likewise, a valuable key to synonomy. It is now announced that a supplement is in course of preparation, to continue the work from 1885 to 1895. It is hoped to publish this supplement during the present year, and this will serve to make the work still more valuable, and place all systematic botanists under a lasting indebtedness to these indefatigable compilers.

Botanical Contributions.

Another indication of the reviving interest in the study of botany is found in the numerous contributions published by the United States Department of Agriculture, and by the botanical departments of various universities. The Government has rendered valuable service to the science by publishing, as special bulletins from the Division of Botany, monographs and carefully prepared descriptive lists of the special collections made principally in the West, Southwest and in Alaska. These have greatly extended our knowledge of a large portion of our own flora, which had been but imperfectly explored.

Among the important contributions from State universities may be cited, as an example, the "Minnesota Botanical Studies."

Flora of Yucatan.

The Field Columbian Museum of Chicago has made a creditable beginning in its first botanical publication, "A Contribution to the Flora of Yucatan," by Dr. Charles Frederick Millspaugh. Our knowledge of the flora of this peninsula and the neighboring islands has been practically limited to the specimens from imperfect collections studied by Professor Hemsley, and described by him in "Biologia Centrali-Americana." The Field Museum has decided to place a collector in this field to accumulate a full knowledge of the flora. The present contribution by Dr. Millspaugh, although intended only as a preliminary catalogue and review of the previous collections, adds considerably to the existing knowledge. In the plants enumerated, we meet quite a number of medical and pharmaceutical interest, such as Acacia farnesiana, Cæsalpinia Bonducella, Melia Azederach, Ricinus communis, Bixia Orellana. Of the citrus family, the lime (Citrus Limetta, Risso) is the most extensively cultivated. The lemon (Citrus Limonium, Risso), the orange (Citrus Aurantium, L.), and the bitter orange (Citrus vulgaris, Risso) are also cultivated to a limited extent.

Of fruits, the Carica Papaya, L., is frequent on the islands. The native or natural form, called by the Mayas, Papaya los Pajaros, or "Bird Papaya," has nearly globular, non-edible fruit, about 1 inch in diameter. It is commonly cultivated throughout the peninsula, when it is called Papaya Put, and is greatly improved in quality. In the island of Cozumel, large, pear-shaped fruit has been raised, from 12 to 16 inches in length and 9 to 12 inches in diameter at the larger end. The pulp is of an orange-red salmon color; rich, juicy and delicious. The flavor is said to improve as the number of seeds in the fruit diminishes.

The Sapote (Achras Sapota, L.) is natural to many parts of the peninsula, especially in the eastern section, where it often attains a height of 50 to 100 feet. It is widely cultivated for its delicious fruit, which also yields, on puncture, the finest of the Yucatan gum or "Chicle."

The genus Ipomea is represented by the following species: I. Jalapa, I. Bona-nox, I. puncticulata, I. Jamaicensis and I. fastigiata.

Rhizophora Mangle, L., is stated to be very plentiful, many small "islands" being composed entirely of this species.

Shu-Lang Root.

The *Kew Bulletin* for September, 1895, p. 230, under this title, describes the Dioscorea rhipogonoides, Oliver, a species of yam indigenous to the mountainous regions of Hong Kong and Formosa. The plant appears to possess some economic value, and occurs in commerce as "dye-root" or "dye-yam," and in Tonquin the French call it "faux gambir." It is usually gathered in spring and early summer, and is largely shipped to Canton, where it is used to dye grass cloth (Boehmeria), and the commoner grades of silk cloth used for summer clothing, a peculiar reddish brown.

Rubber Industry in Lagos.

The botanical source of the rubber produced in this British possession on the west coast of Africa is now decided at Kew to be Kickxia Africana,[1] Benth. (*Kew Bulletin*, October, 1895, p. 241). The name *female rubber tree* is locally applied to the Kickxia Africana, to distinguish it from Holarrhena Africana,

---

[1] The seed of this Apocynaceæ originally entered commerce as a variety of Strophanthus. See AMERICAN JOURNAL OF PHARMACY, 1895, p. 45.

G. M. B.

which is fancifully called the *male rubber tree.* The latter is a Rubiaceous plant, not known to yield any rubber.

The growing importance of this industry is indicated by the fact that for the half year ending June 30, 1895, 588,633 pounds of rubber have been exported from Lagos, valued at £29,765 18*s.* 5*d.*

In tapping the tree, the bark is first cut in a vertical direction from the bottom to the top. This main groove is ½ to ⅝ inch broad, and deep enough to reach the inner bark. On each side of this, two series of oblique grooves, about 2 feet apart, are cut, each running into the main groove. The side grooves are made, beginning at the top and gradually reaching the base of the tree. All the milk exuding from the lateral grooves will find its way into the main groove, and so, ultimately, to the bottom, where a vessel is placed to receive it.

Should the new Kickxia rubber continue of commercial value, there is no doubt that it will eventually be possible to establish regular plantations, and thus make the industry a permanent one. Owing to the climbing habit of the species of Landolphia, which have hitherto yielded African rubber, it was not practicable to cultivate them in regular plantations, as they required the support of other plants, and, when once tapped, many years would have to elapse before they would be fit to yield another crop. With the Kickxia these practical difficulties disappear.

Ai Camphor.

This is a product obtained from Blumea balsamifera,[2] DeC., an evergreen shrubby composite, abundant in Eastern India, and also found in South China and the islands of Haïnan and Formosa. The *Kew Bulletin*, for November, 1895, p. 275, publishes some interesting correspondence regarding its production and mar-

---

[2] The *Pharmacographia* describes this camphor, and states "that the chemical examination by Plowman has proved that it has the composition $C_{10}H_{18}O$, like Borneo camphor; but the two substances differ in optical behavior, an alcoholic solution of Ngai camphor being levogyre in about the same degree that one of Borneo camphor is dextrogyre. As Ngai camphor is about ten times the price of Formosa camphor, it never finds its way to Europe as an article of commerce. In China it is consumed partly in medicine, and partly in perfuming the fine kinds of Chinese ink."

The *Pharmacographia Indica*, Vol. II, page 252, states that "the camphoraceous Blumeas are called by Sanskrit writers Kukundara and Kukkura-dru, 'dog-bush,' because their pungent odor is attractive to these animals. In

keting. The leaves are collected in the fall and winter months, and are allowed to wilt for a couple of days. They are then placed in a still, consisting of a cask about 2 feet high, open at both ends, and of a diameter suitable to place over a large Chinese frying-pan. The pan is filled with water, and over this is placed a coarse sieve of woven bamboo. The cask is cemented with clay to the edge of the pan, and, after receiving its charge of 30 or 40 pounds of leaves, a large brass basin is placed on the upper end of the cask and is filled with cold water, which is frequently changed. Fire is placed under the frying-pan, and distillation is continued for about four hours. At the end of this time the bottom of the basin is found to be coated with a layer of crystallized substance about $\frac{1}{16}$ inch thick. This is the crude camphor, or *ngai-fen*. About 15,000 pounds of this crude camphor is annually shipped from Hainan to Canton, where it is refined, and is then known as *ngai-pien*.

Kew Bulletin, November, 1895, p. 293.

Sumach. There are three sorts of sumach known in commerce. Venetian sumach or young fustic consists of the twigs of Rhus Cotinus. This yields a bright yellow dye, much used in calico printing. North American sumach is yielded by Rhus glabra,[3] the fruit, leaves and bark being used for their astringent properties in tanning leather. The sumach of the Mediterranean, and the one more widely used,

---

addition to Blumea balsamifera and B. densiflora, which are considered by some botanists as identical, B. aromatica and B. lacera are considered by the Hindus to be deobstruent and resolvent, and particularly useful in the disease of the nose called Ahuah. The powdered leaves are given internally in 2-drachm doses mixed with butter, and also used as a snuff. The juice of the leaves is placed in the eye to cure chronic purulent discharges; it is also used as an anthelmintic and astringent."

Stearoptens have been observed in several other composites, notably in Chrysanthemum Parthenium, Pers., and Inula Helenium, L. The genus Pluchea, likewise belonging to the tribe Inuloideæ, and closely related to Blumea, is represented by several species in America. P. bifrons, DeC., and P. camphorata, DeC., are the Atlantic seacoast representatives. While they have not yet been chemically examined, their characteristic odor indicates that a camphoraceous principle is most likely present. G. M. B.

[3] The *Kew Bulletin* was evidently misinformed about North American sumach. While some of it is obtained from Rhus glabra, the great bulk is gathered from R. copallina, chiefly because the latter species yields a larger percentage of tannin than any other sumach in America. R. glabra is the only one specified by the U. S. Pharmacopœia.—Editor AM. JOUR. PHAR.

consists of the powdered leaves only of the Rhus coriaria, a hardy shrub growing on the rocky slopes of Sicily and elsewhere.

In 1894, the amount of sumach, ground and in the leaf, exported from Palermo to the United Kingdom, amounted to about 3,400 tons, valued at £26,181, whilst the total export of sumach to all countries during the same period was about 25,000 tons, of which France took 10,000 tons, America 5,500 tons, Germany 3,265 tons. The approximate value of the exports of this product in 1894 was £192,923 14*s*. 8*d*.

Absolutely pure sumach should contain from 20 to 22 per cent. of tannin as gallotannic acid. However, perfect purity never appears in the market, and a satisfactory quality and one of greater strength than generally sold, would be 20 per cent. tannin calculated as gallotannic acid.

The Pepper Tree.

Much of the beauty of the streets and gardens of Southern California is due to the presence of this South American and Mexican tree, the Schinus molle, which the Spanish priests carried to California when they established their missions. It is now the most commonly planted shade and ornamental tree in all the region south of the Bay of San Francisco. Travellers from the East usually regard it as a native and typical California tree.

Schinus molle is an excellent street tree for dry arid regions. In wet weather the leaves emit a pungent balsamic odor, due to the resin glands with which they abound, and which, when the leaves are placed in water, burst, giving them an apparently spontaneous movement. In Chili, according to Molini, a kind of red wine, agreeable in flavor, but very heating, is prepared from the berries, and from the bark a dye of the color of burned coffee. (*Garden and Forest*, December 18, 1895, p. 502.)

The Jaborandi Leaves of Commerce.

Mr. E. M. Holmes, in a paper read before the Chemists' Assistants' Association, and printed subsequently in the *Pharmaceutical Journal*, December 21, 1895, p. 520, reviews, in his usually lucid and interesting style, the history, botany and chemistry of the various commercial varieties of jaborandi. The name jaborandi appears to be applied, in various countries in South America, to a number of plants belonging to the Rutaceæ and Piperaceæ, all possessing sialogogue properties.

(1) PERNAMBUCO JABORANDI.—The official jaborandi was first brought to Paris from Pernambuco, by Dr. Coutinho, a Brazilian physician, and was identified by Prof. Baillon, in 1874, as the leaflets of Pilocarpus pennatifolius, Lemaire, a plant indigenous to the province of San Paulo. As early as 1875, Mr. Holmes became convinced that the leaves of commerce showed characters distinctly different from those of P. pennatifolius, and were more closely allied to those of P. Selloanus, Engler. Subsequently, in 1892, he obtained from the Cambridge gardens a flowering branch of a plant which he identified as the source of this variety of jaborandi, and proposed for this species the name of Pilocarpus jaborandi.

(2) PIPER JABORANDI.—In 1875, the leaves and roots of a species of Piper were imported from Brazil under the name of jaborandi. The leaves are thin, papery, grayish, tapering equally to both ends, and have not the large oil cells characteristic of the Rutaceæ. The leaves of Piper jaborandi, Vell., P. reticulatum, L., P. citrifolium, Lam., P. nodulosum, Link, and P. mollicomum, Kunth, are said to be used under the name of jaborandi. The leaves are generally mixed in commerce with portions of the stem which exhibit the curious enlarged nodes, characteristic of pepper stems, and the equally remarkable stem structure.

(3) PARAGUAY JABORANDI.—The leaves of the Pernambuco jaborandi had not been long in commerce when a plentiful supply of jaborandi leaves from Rio Janeiro, and probably also from Buenos Ayres, entered the London market, but it was soon discovered that they yielded much less alkaloid than the Pernambuco kind. The leaflets were thinner than those of the Pernambuco jaborandi, and the leaves had only two or three, never four, pairs of leaflets. The leaflets tapered more to the base, so that the widest portion was above the middle; the lateral veins were not prominent and the upper surface was grayish green. These characters, as well as those of the fruit, seemed to correspond with P. pennatifolius, Lem. There is little doubt that the leaves of P. pennatifolius have been exported from Paraguay and the neighboring provinces by way of Rio Janeiro and Buenos Ayres.

In 1877, Prof. Baillon examined specimens of all jaborandi sold in Paris during the two previous years. He recognized leaflets of Piper jaborandi, Pilocarpus pennatifolius and P. Selloanus. P. Selloanus, Engl., seems very near to P. pennatifolius, the chief difference

being that the pedicels of the flowers are half as long again (15 mm.), and that the leaflets are always glabrous; but the fruits met with in the Paraguay jaborandi of commerce never have pedicels so long. The Paraguay jaborandi of commerce is, however, not uniform. There appears also to be two species cultivated at Kew under the name of P. pennatifolius. The several species found in Paraguay, and bearing purple flowers, require a more careful examination at the hands of local botanists.

(4) MARANHAM, OR SMALL JABORANDI.—In 1893, Mr. T. Wardleworth described another kind of jaborandi, which had been imported into Liverpool. This proved to be a new species, and was appropriately named by Dr. Stapf, Pilocarpus microphyllus, as it has the smallest leaves of any known pilocarpus. The leaflets yielded to Mr. Conroy an alkaloid possessing all the chemical properties of pilocarpine. Mons. A. Petit obtained 0·5 per cent. of nitrate of pilocarpine.

(5) CEARA JABORANDI.—In 1894, specimens of a new jaborandi were received. The upper surface of the leaflets is a dark brownish green, and the lower a yellowish tint, and covered with short curved hairs. They are smaller than P. pennatifolius and have recurved margins. The fruit is short pedicelled and characterized by warty ridges on the back of the carpels. The leaves have only two pairs of leaflets. The leaves yielded only ·02 per cent. of crystalline nitrate. Mr. Holmes has named this species Pilocarpus trachylophus.

(6) ARACATI JABORANDI.—This is evidently from one of the simple-leaved species, probably from P. spicatus, A. St. Hil., and is the first appearance of other than the pinnate-leaved species in commerce. The leaves are about the size and very like in shape to those of Laurus nobilis. The upper surface is polished and the veins scarcely visible; on the under surface they are more visible, but are very slender. The texture is papery, but rather rigid, brittle, of a dark brownish green above, and of a rather pale hue beneath. The purely lanceolate outline and the short twisted petiole readily distinguish it, whilst the pieces of twig attached show that it is a simple-leaved species. Mons. A. Petit was unable to find pilocarpine in them, although he found a small quantity of another alkaloid.

Poisoning of Plants.

F. W. Cord describes, in *Garden and Forest*, experiments tried at the Agricultural College, Lincoln, Neb., in order to decide the effects of poisonous substances upon plant life. The experiments were undertaken in order to practically test the statements of physiologists that the roots of plants have little or no power of selecting their food, and can be poisoned like animals. The experiments were tried by subjecting corn and beans, previously germinated and developed a few inches, to solutions of alcohol, corrosive sublimate, sulphuric acid, extract of aconite, arsenic and strychnine. From the results the following conclusions are deduced:

(1) Irritant poisons, such as arsenic, corrosive sublimate and sulphuric acid, kill plants in water cultures in a very short time, except in ·01 per cent. solutions, and in such solutions plants were less vigorous than in city water.

(2) The neurotic poisons, alcohol, aconite and strychnine, killed no plants, with the exception of the very strong solution of alcohol and one plant treated with strychnine.

(3) All the poisons used, except alcohol, affected beans more quickly and severely than corn. Alcohol, on the contrary, affected corn more than beans.

(4) The poisons produced much greater effects in water than in soil cultures.

The strongest solution of aconite and strychnine used contained only one-tenth of 1 per cent.; hence, it is possible that a stronger solution might have a different effect; yet the same strength of arsenic and corrosive sublimate killed plants very quickly. The results are more striking when it is remembered that from 20 to 40 times as much arsenic or corrosive sublimate is required to prove fatal to animals as of strychnine sulphate. The irritant or corrosive poisons, however, attack and decompose tissue; hence, may be expected to injure plants as well as animals. The neurotic poisons affect only the nerves of animals, and are, therefore, less likely to injure plants.

Poisonous Influence of Various Species of Cypripedium.

In Bulletin No. 9, Part VII, of the Minnesota Botanical Studies, Prof. D. T. MacDougal directs attention to the fact that the leaves and stems of Cypripedium spectabile and C. pubescens exert a poisonous influence on the human skin. The

first observations were made on plants in the open air in the localities in which they grew. The subsequent experiments were made with plants cultivated in a greenhouse in which were no known poisonous plants. Careful tests were made with C. spectabile on nine persons, six of whom were poisoned in a degree corresponding to the manner of application of the plants to the skin. C. pubescens gave about the same results, and C. parviflorum also exhibited dermatic action.

Specimens of the pointed and glandular hairs found in abundance over the entire plant were removed and touched separately to the skin. It was shown that the irritant action was due to the secretion of the glandular hairs only. If the development of the glandular hairs is followed, it will be found that the secretion begins to accumulate in the distal end of the cell shortly before it reaches maturity and filters through the wall, forming a reservoir between the wall and the outer cuticle layer. On account of the extreme small quantity of the secretion, its exact chemical nature could not be ascertained. It was found to be soluble in alcohol, and gave the reactions of an oily substance.

It was found, further, that the irritant action of the plants on the skin increased with the development of the plant, and reached a maximum effect during the formation of the seed capsules. This corresponds with the activity of the glandular cells and the amount of secretion present.

Phosphate Production.—For the past year or two a good deal of apprehension has been felt by phosphate producers in this country and elsewhere, as to the competition of the African deposits. The extent of those deposits was outlined in *The Mineral Industry*, Vol. III, but their present importance has been very much exaggerated by general report. The Tunisian mines are not yet worked to any considerable extent, and, according to *l'Engrais*, the total production of Algeria in 1895 was 121,475 metric tons, which is only a very small amount compared with the total consumption of Europe alone. At present, very little work is in progress, owing to the difficulties over the concessions at Tebessa and elsewhere. Our Florida producers have, apparently, no occasion to be alarmed at African competition for some years to come. A more formidable interference with their business is found in the rapidly increasing use of Thomas slag as a source of supply of phosphoric acid. The quantity of this slag produced in Germany and Belgium is growing, and its application in the manufacture of fertilizers has been promoted by its abundance and cheapness, so that it has become a considerable article of commerce.—*The Engineering and Mining Journal*, February 1, 1896.

EDITORIAL.

THE SEVENTY-FIFTH ANNIVERSARY OF THE PHILADELPHIA COLLEGE OF PHARMACY.

The Philadelphia College of Apothecaries was instituted February 23, 1821. Organization was effected about one month later, March 27, when officers were elected. The present year, therefore, is the appropriate time in which to hold the seventy-fifth anniversary of the foundation of the College. Neither of the foregoing dates being a convenient time for the exercises of such an occasion, the 22d of April was selected as being more suitable. At that time the celebration will take the nature of a banquet to members of the College, the Alumni Association and invited guests.

It may be noted, in this connection, that in 1871 the fiftieth anniversary of the College was celebrated in a similar manner. Among the prominent speakers on that occasion were Drs. Rogers and Leidy, of the University of Pennsylvania; Dr. S. D. Gross, of the Jefferson Medical College, and Professors Parrish and Procter, of the Philadelphia College of Pharmacy. None of these men have survived the twenty-five years which have elapsed since then.

THE METRIC SYSTEM IN THE UNITED STATES.

We are gratified to note that a bill for the adoption of the metric system of weights and measures in this country, similar to the one printed last month (page 165), has been favorably reported by the Committee on Coinage, Weights and Measures, and will, no doubt, be brought up at some future time before the House of Representatives for action.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

THE SCIENCE OF NUTRITION. By Edward Atkinson. Also, THE ART OF COOKING IN THE ALADDIN OVEN, with directions and many recipes. Sixth thousand. Boston: Damrell & Upham, 1896.

The efforts of the author have been directed to the perfection of a scheme whereby separate families, of moderate means, living in their own houses, may secure wholesome, nutritious food, well cooked, without it being necessary for any member of the family to devote so much time to the preparation of the food as might seriously hamper the effort of the family in maintaining itself. To the accomplishment of this end, he has invented and perfected the Aladdin oven, with which the cooking for an ordinary-sized family may be accomplished with an ordinary kerosene lamp. The principles involved consist, firstly, in utilizing all the heat evolved, and, secondly, in subjecting the food to a moderate temperature for four or five hours, instead of one hour or less, as is the case with the present methods of cooking. The new apparatus being practically air-tight, the food is not allowed to become dry during the prolonged heating; on the contrary, the natural moisture and flavor are retained.

Dr. Atkinson has long been known as a political economist of the first class, and his unselfish labors on the subject of foods has taken practical shape in the present volume. First published in 1892, it has,in four years, made many converts to the new methods. Through the liberality of Mr. Andrew Carnegie,

the book has recently been placed in 3,500 public libraries, so we may expect to hear more concerning it in the future. Any system which will tend to reduce the cost and waste of food and fuel, as this one does, ought to become popular with the masses.

THE CHEMISTRY OF THE AUSTRALIAN INDIGENOUS VEGETATION. By J. H. Maiden. Presidential address before the Chemical Section of the Australasian Association for the Advancement of Science.

In discussing this subject, Mr. Maiden endeavored to answer the following questions: (1) What has been done in the direction of chemically investigating our indigenous plant products? (2) What remains to be done? (3) How can it best be done? In answering these questions, quite a variety of subjects have been covered, notably: "Human foods and food adjuncts," in which the native mannas are treated in a scientific and interesting manner. "Gums, resins, kinos, eucalyptus oils, other essential oils, fixed oils, perfumes, dyes, tans, timbers and fibres," all receive a full share of attention, and the necessity of investigating these different substances is dwelt on in forcible language. A section is also devoted to "substances reported medicinal (drugs)" and the resources of Australia in this connection clearly set forth.

ANNALES DE L'INSTITUTE COLONIAL DE MARSEILLE. Published under the direction of Professor Edouard Heckel. Lille, 1895.

This volume is made up of five interesting contributions, as follows:

"Contribution to the study of Robinia Nicou, from a botanical, chemical and physiological standpoint." By E. Geoffroy.

"Contribution to the botanical, therapeutical and chemical history of the genus Adansonia." By Dr. Charles Gerber.

"On Quassia Africana and Pancovia Heckeli, which is substituted for it." By Dr. L. Claudel.

"On Bakis (Tinispora Bakis, Miers) and Sangol (Cocculus Leaeba, G. P. et Rich), of Senegal and Soudan." By Edouard Heckel and Fr. Schlagdenhauffen

"A study of Psidium (Goyavier)." By M. Khouri.

All of these contributions are illustrated, and the whole is a record of research work that will have a permanent value.

ÜBER EINIGE JAPANISCHE NAHRUNGSMITTEL. By Dr. Oscar Loew. Tokyo Japan.

PRELIMINARY NOTES ON THE BARK OF CARISSA OVATA, R. BR., VAR. STOLONIFERA, BAIL. By J. H. Maiden and H. G. Smith.

ANTITOXINS. Gibier's Double Antitoxin. Tetanus and Streptococcus Antitoxins. From the Biological and Vaccinal Department of the New York Pasteur Institute, through Lehn & Fink.

This pamphlet of thirty-four pages gives a full account of the various serums manufactured by the above-mentioned institution. Most of them are obtainable in both liquid and dry condition. A number of well-executed illustrations add to the interest of the contribution.

CONTRIBUTIONS TO A KNOWLEDGE OF AUSTRALIAN VEGETABLE EXUDATIONS, NO. 1. By J. H. Maiden and H. G. Smith.

ON A NATURAL DEPOSIT OF ALUMINUM SUCCINATE IN THE TIMBER OF GREVILLEA ROBUSTA, R. BR. By J. H. Maiden and Henry G. Smith.

THE RELATIONSHIP OF THE HEAT OF VAPORIZATION OF GASES TO THEIR DENSITY AND ALSO TO THEIR BOILING POINT. By Wm. L. Dudley. Reprint from the *Journal of the American Chemical Society*, December, 1895. From his investigations the author enunciates the following law: "In any homologous series, the heat of vaporization in a unit of volume of the vapor, under the same conditions as to temperature and pressure, is proportional to the density and also to the absolute boiling point."

SOLUZIONE FERRUGINOSA ARSENICALE. By Dr. G. Siboni. Reprint from the Bollettino Chimico-Farmaceutico, November, 1895.

PROSPECTUS OF THE TWENTY-FOURTH ANNUAL SESSION OF THE CALIFORNIA COLLEGE OF PHARMACY. San Francisco, California, 1896. Unlike the Eastern colleges, the session of this Institution commences April 14th and closes October 28th.

BOTANICAL PRODUCTS OF THE UNITED STATES PHARMACOPŒIA, 1890 (particularly of plants found in Indiana). By John S. Wright. Botanical Department of Eli Lilly & Co., Indianapolis, Indiana.

LIST OF PUBLICATIONS OF THE U. S. DEPARTMENT OF AGRICULTURE, from 1841 to June 30, 1895, inclusive. Washington, 1896.

MERCK'S 1896 INDEX. An encyclopædia for the physician and pharmacist, stating the names, synonyms, source or origin, chemical nature and formulas, physical form, appearance, properties, melting and boiling points, solubilities, gravities, percentage strength, physiological effects, therapeutic uses, modes of administration, doses, incompatibilities, antidotes, and market values of the chemicals and drugs used in medicine, chemistry and the arts.

THE PHARMACAL GAZETTE. A monthly journal devoted to the interests of pharmacy. J. E. Morrison, editor and publisher.

Volume I, No. 1, of this new publication presents a creditable appearance, and it offers a large amount of valuable reading matter, covering a wide range of pharmaceutical subjects. We hope the editor will be able to continue to give as much in each succeeding number.

THE ICONOCLAST, an ephemeris issued at intervals. By Herbert B. Harrop and Louis Wallis. Columbus, O. January and February, 1896.

REPORT OF THE PROCEEDINGS OF THE ILLINOIS PHARMACEUTICAL ASSOCIATION. Sixteenth Annual Meeting, 1895.

THE COMMON SCHOOL LAWS OF PENNSYLVANIA. Revised and arranged by Nathan C. Schaffer. Harrisburg, Pa. Pp. 395.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, March 17, 1896.

The sixth regular Pharmaceutical Meeting was held in the Museum of the College at 3 o'clock.

Mr. E. M. Boring presided, and the minutes of the previous meeting were allowed to stand.

The first paper, entitled "A Proximate Analysis of Polygala Senega," was read by Mr. J. Henry Schroeder (see page 178).

Professor Trimble remarked upon the proportion of albuminoid matter, stating that 20 per cent. is rather a large amount to find in roots, and that it is probably stored as reserve material. Professor Lowe also thought this to be the case, as the drug contains neither starch nor inulin.

Mr. Lyman F. Kebler read the next paper, which was entitled "Laboratory Notes" (see page 193), and under this head he included results of experiments with oil of cassia, elm bark, ipecac root, potassium iodide, reduced iron and saffron. These experiments were mostly for the purpose of detecting impurities and adulterations.

Mr. Kebler found that benzin extracted the coloring matter from air-dry saffron, which contains about 14 per cent. of moisture, more readily than it did from the drug previously deprived of moisture.

Professor Trimble did not think that the amount of moisture in the air-dry drug would interfere with the action of the benzin, and that the failure to dissolve the coloring matter in the latter instance was probably due to a change caused during the process of drying.

Mr. Wallace Procter spoke of a spongy gray iron which was formerly much used, and which was quite pure in most respects, except a slight contamination of sulphide.

Prof. Remington said that this product was formerly manufactured by Messrs. L. Martin & Co., of New York, and that the presence of a small percentage of sulphide was owing to insufficient washing of the ferrous carbonate used in its manufacture. The sulphide was changed into hydrogen sulphide when brought into contact with the liquids of the stomach, causing unpleasant eructations.

Prof. Remington also referred to the difficulties into which the Ohio Food and Dairy Commissioners have gotten in the stand they have taken in regard to the pharmacopœial requirements or to the construction which they have put upon the food laws of the State. He said the important question to be considered was the kind and amount of impurity, and whether it would interfere with the physiological action of the drug containing it, and mentioned in this connection the needless high standard of the tests for the alkaloidal salts of cinchona, the unnecessary expense incurred in removing the last 1 or 2 per cent. of moisture from ether, and the presence of potassium carbonate in potassium iodide, which is an advantage rather than an objection.

Prof. Lowe then read a paper entitled "Botanical Notes" (see page 191). His paper was accompanied by specimens of Japan and Indian aconite roots, stems of Magnolia, roots of Apocynum androsæmifolium and Apocynum Cannabinum and a dried specimen of Anthemis nobilis.

Miss Bertha L. DeGraffe read an interesting paper on "Opuntia Vulgaris"

(see page 169). The economical uses of the plant were considered, it being grown in the South for hedges, and also used for feeding cattle. The juice of the fruit, which is a beautiful purplish-red color, is used for coloring wine. Accompanying the paper were specimens of the plant and fruit, and photographs of the same, and also a sample of an aqueous extract of the coloring substance. It was stated that ammonia changes the color and could possibly be used for detecting this substance in wine.

Mr. Boring wished to know what is understood by a neutral Basham's mixture. Mr. F. W. Haussmann said that this was a prescription of a certain physician who wishes the acetic acid omitted from the preparation, and also that he desires four times the iron strength of the official preparation.

Prof. Trimble called attention to the following-named specimens: Licorice seeds, which were purchased in New York City for 20 cents per ounce, and were intended for planting; two samples of kino, which were presented by Baron Ferd. von Mueller, of Melbourne, Australia, and were from Eucalyptus regnans and Eucalyptus globulus respectively; two samples of tungsten ore, known as Scheelite and Wolframite (presented by Mr. Bullock), a sample of an Egyptian sugar from vacuum pan and centrifugal, polarizing 99 per cent.; one of a Mexican sugar made by evaporating cane juice to dryness, and about like maple sugar, and one which came from Guadaloupe.

Prof. Remington presented, on behalf of Mr. Chas. Bullock, a filter folder which was of French manufacture, and was introduced into this country about thirty-five years ago. It seems to have no other value than that of a museum specimen.

Prof. Trimble read a "Note on Distilled Water," by Prof. J. U. Lloyd (see page 187), referring to some statements made in a former paper on this subject.

Prof. Ryan considered it important to direct the attention of druggists to a kind of advertising which might cause a reflection on themselves. Some wholesale firms put up packages of compressed herbs, and enclose with the packages pamphlets which are extremely objectionable.

Mr. Boring desired information in regard to the legal status of Canadian and English chemists, which would enable them to sell phenacetine in this country for 65 cents per ounce. He said that an agent from Montreal, Canada, had made him such an offer, and welcomed any legal action which might be taken against him (the agent). No definite statements could be made in regard to this matter, for it seems that no test cases have come up.

On motion, the meeting adjourned.

T. S. WIEGAND,
Registrar.

According to G. W. A. Kahlbaum (*Berichte*, **29**, 69) the condenser bearing Liebig's name was invented by Christian Ehrenfried Weigel, and described by him in his dissertation of March 25, 1771 (Liebig was born in 1803). Weigel's condenser was described in Goettling's "Manual of Chemistry," 1794, and Liebig, when he first described the use of this condenser, mentioned the source from which he had obtained the description of the apparatus.—O. Hehner, in *The Analyst*.

THE AMERICAN JOURNAL OF PHARMACY

MAY, 1896.

HOW TO DISTINGUISH THE VIBURNUM BARKS IN THE STATE OF POWDER.

BY L. E. SAYRE,

Member of Research Committee C, of the Committee on Revision of the United States Pharmacopœia.

In a paper communicated to this journal a few months ago,[1] the writer discussed certain physical characteristics of the Viburnum barks, with a view to their identification in the state of powder. The problem presented to the Research Committee, with reference to the subject, was formulated as follows:

(1) What are the distinguishing characteristics which will identify the bark of the stem and the bark of the root of Viburnum prunifolium?

(2) How can one distinguish between the bark of Viburnum prunifolium and V. opulus?

(3) What are the differential characteristics of these barks which will enable one to distinguish between them in the crushed or powdered condition?

The first and second of these problems were discussed in the former paper, the third was left for a future one. Cross-sections of the stem bark of V. opulus and of the bark of the root of V. prunifolium, as seen under the microscope, were then presented, and are reproduced now (see *Figs. 1* to *4*). It was shown in the case of V. opulus that in the inner layer of the bark there were large clusters, in the form of elongated bands, of bast fibres, associated with but few

[1] AMER. JOUR. PHARM., 67, 387.

stone-cells, these interrupted bands being separated from each other radially by narrow medullary rays, and longitudinally by broader bands of soft bast. The presence of tannic matters in the middle bark, in the soft bast and in the medullary rays was referred to. It

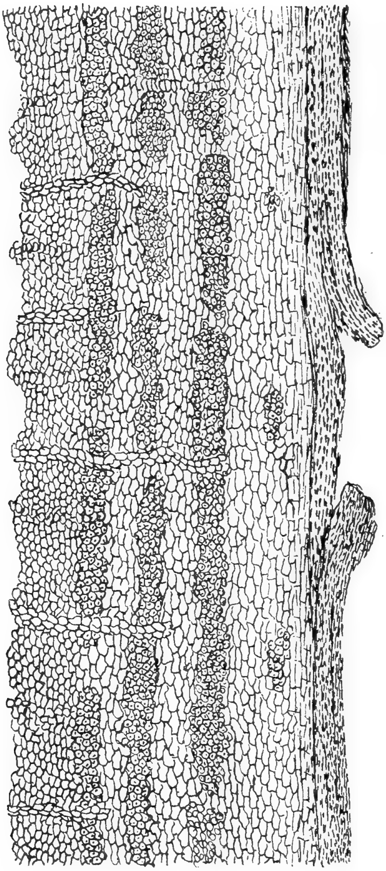


Fig. 1.—Viburnum opulus. Bark of stem. Cross-section.

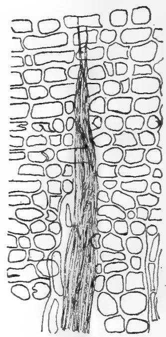


Fig. 2.—Viburnum opulus. Bark of trunk. Longitudinal section.

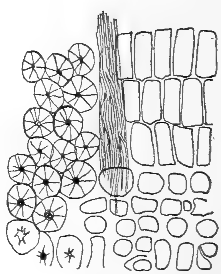


Fig. 3.—Viburnum prunifolium. Bark of trunk. Longitudinal section.

was shown in the case of V. prunifolium that it contained, instead of the bands of bast fibres, numerous groups of stone-cells irregularly disposed. Longitudinal sections were also shown, making clear the points made—that these barks were quite different in structure. The statement was made that it was probably possible to distin-

guish between the V. opulus and the V. prunifolium in the powder by the presence or absence, in the powder, of stone-cells. A further report on this point was promised when some experience had been obtained in working with the powders. It is intended, therefore,

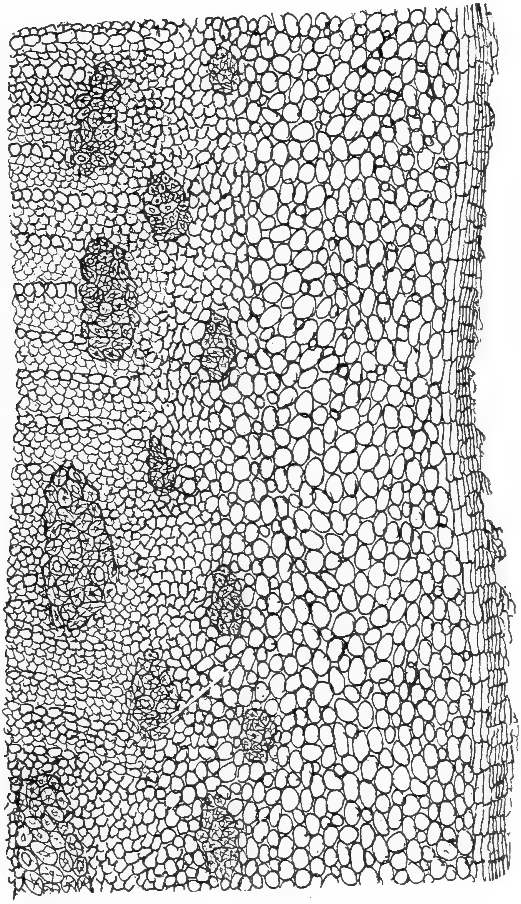


Fig. 4.—Viburnum prunifolium. Bark of root. Cross-section.

in this paper to discuss this question, and, to connect it with the last paper, I should say that the third problem above mentioned will be considered: What are the differential characteristics which will distinguish the powdered barks under the microscope?

I should state here, to those who have offered to share with me

in this work, that I have been unfortunate in being unable to furnish them with authentic material to work upon. The material collected by the chairman of the sub-committee taking up this work has been only sufficient for my own work; a further supply has not as yet been received. It is to be hoped that in the near future abundance of material will be had, so that those who would kindly further the investigation—verify or disprove what I have to say—will be furnished with reliable samples. To those whose experience is quite limited in this class of work, who desire information as to methods in the microscopic examination of powders, it might be in place to say a word or two, if I may do so without seeming to impart information as an expert. The manipulation necessary to the examination of powders is quite simple—not at all complicated.

The manipulation may be stated, in a general way, as follows:

I. Location and determination of elements in the substance in the whole state by study of—

(1) Cross-section.

Treat with

a, Chlor-zinc iodide;

b, Hæmatoxylon;

c, Methyl violet, etc.

(2) Longitudinal section.

II. Study of comminuted substance:

(1) Seek for the elements revealed in the section.

(2) Determine which elements remain most firmly adherent, and which separate most easily.

(3) Observe cuticular or external fragments, shape of cells, etc.

(4) Seek for external appendages, hairs, etc.

Those who are familiar with the above reagents know that they will often aid in identifying in the powder what has been located in cross and longitudinal section. The same reagents used in both cases will act the same, and thus identification is facilitated. Before being able to identify drugs in the powdered condition it is necessary to fix upon some feature of it that is most prominent and characteristic. In the case of leaves, for instance, there are often hairs and glands that, in their form, seem at once to distinguish the specimen upon which they occur. As an example, digitalis may be

mentioned. Growing upon the surface of the leaves are numerous hairs which are multicellular and characteristic; these in the powder are not completely destroyed, as are not other important histological elements. Even the class of powders known as impalpable, while they present greater difficulty, there is almost always found in them some elements and fragments whose characteristics are constant and sharp, which the pulverization has not greatly modified. If, perchance, they are broken into fragments, the fragments retain characteristic markings and serve as means of identification. The following procedure in the examination may be modified to suit

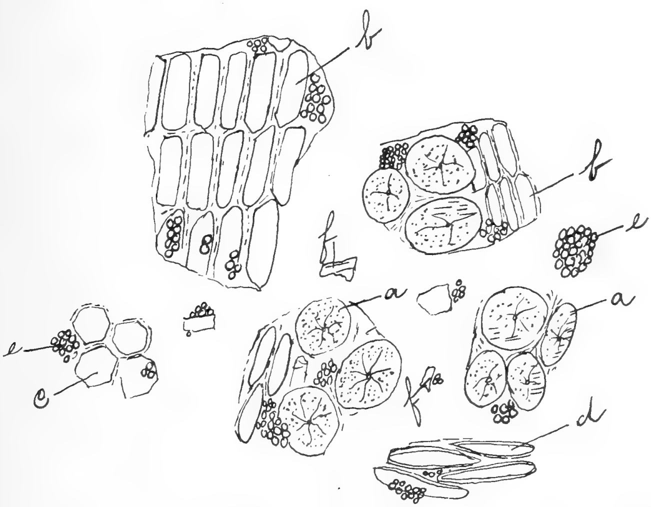


Fig. 5.—Viburnum prunifolium. Powdered root-bark, × 400: *a*, stone-cells; *b*, inner bark cells; *c*, middle bark cells; *d*, inner cells of middle bark; *e*, starch grains; *f*, fragments of cork layer.

certain different powders, but it is a general direction which will serve in most cases. Add a few particles of the well-mixed powder in a porcelain capsule containing a mixture of alcohol, glycerin and water; after about two hours' maceration, examination is commenced, when the nature of the elements enclosed in the cells, which have not been destroyed by pulverization, can be determined (starch, aleurone, inulin, etc.). To render more apparent the forms of the various separated elements and fragments, boil the powder in an alkaline water. In this manner one can distinguish more quickly and more completely all of these histological peculiarities, which

were rendered partly invisible by the presence of their contents. It is essential, when examining the fluid mixture of the powder (in, say, a homœopathic vial), to take samples from the bottom, middle and top of the fluid, in order to obtain all of the elements. In the case of Viburnum prunifolium, doubtless the stone-cells will be found in the bottom of the bottle after it has stood for a time.

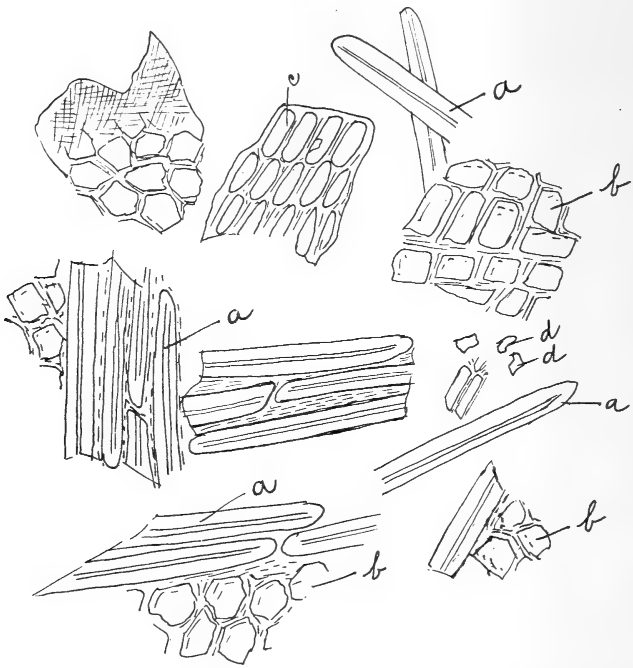


Fig. 6.—Viburnum prunifolium. Powdered trunk-bark, × 400: *a*, stone-cells; *b*, inner bark cells; *c*, middle bark cells; *d*, outer cells of middle bark; *e*, inner cells of inner bark; *f*, cells from outer layer.

A word in regard to drawings and the meaning of illustrations. In order to present an intelligible representation of the microscopical elements of a powder, or to understand these representations, it should be understood that it is necessary, in some cases, to eliminate certain features, and to accent others. The true picture, in order to be descriptive, may be obtained by selecting from many different views; so that any drawing, such as I have presented here, is understood as what could be seen under most favorable circumstances.

The forms are what may be seen if thickness of fragment, coloring matter and other causes do not prevent.

DESCRIPTION OF THE POWDERS.

Viburnum Prunifolium, Bark of the Trunk.—A brownish or reddish-gray powder, darker, by several shades, than that of the other varieties; taste slightly bitter. Under the microscope the absence of fibrous tissue is noticeable. The stone-cells are readily distinguished and quite numerous, as they are in the bark of the twigs and in the bark of the root. See *Fig. 6.*

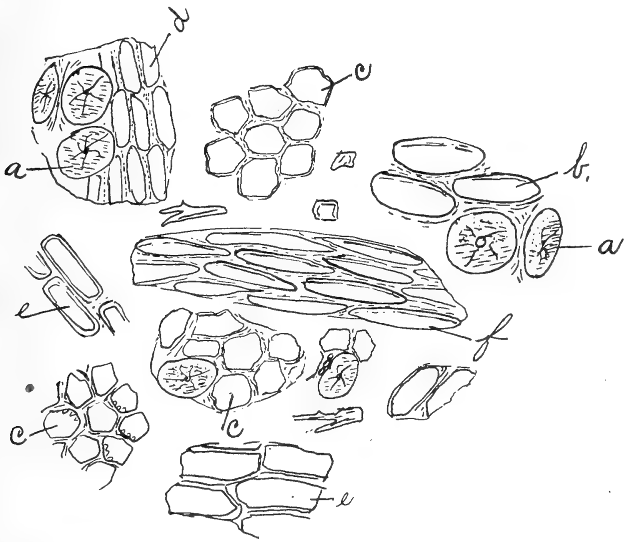


Fig. 7.—Viburnum opulus. Powdered bark, $\times$ 400: *a*, bast fibres in bark, situated in middle bark; *b*, middle bark cells; *c*, outer layer of middle bark; *d*, fragments of cork layer.

Viburnum Prunifolium, Bark of the Twigs.—A light brownish-gray powder, very easily pulverized. When viewed under the microscope there is a close resemblance to the trunk bark, and the difference seems too slight to be shown in a drawing. The color is quite characteristic.

Viburnum Prunifolium, Bark of the Root.—A grayish powder. Under the microscope a sharp distinction from the above is apparent. It displays a great number of starch granules, which, of course, is more pronounced by treatment with iodine T. S. The difference

from the others is thus brought out very visibly. Taste much more bitter. See *Fig. 5.*

Viburnum Opulus.—A silvery-gray powder. Under the microscope it presents a fibrous appearance, the wood fibres being numerous.

In this bark a solution of ferric chloride showed a decided reaction in bringing about a darkening of the tissues of the middle layer. See *Fig 7.*

As to the drawings accompanying this paper, I desire to state they represent the average appearance of the powders represented.

Several students in the laboratory have verified the work, and the present illustrations are copies of the drawings of one of our students—Wm. V. Ingham—who observed the directions I have above outlined.

COLORS OF POWDERS.

There is, at present, no standard to which shades of colors may be referred. As it is necessary to have some standard for comparison, and as this work of powder identification is in its incipiency, I would suggest that a standard of tints be recognized to avoid confusion of terms. This will appeal to any one who has tried to identify powders or drugs from written descriptions of color. There is, at present, in existence, and accessible to every one, a graduated standard of colors and tints that would serve the purpose most exactly. I refer to Ridgway's nomenclature of colors.[1] Adopting this as a standard, the colors of the Viburnum barks in No. 60 powder would be stated as follows:

Viburnum prunifolium, trunk bark	7, walnut-brown.
V. prunifolium, twig bark	19, wood-brown.
V. prunifolium, root bark	12, olive-buff.
V. opulus	15, vinaceous-buff.

This suggestion exposes me to the criticism of being blessed with an over-refinement of nicety, it is true; but the matter of identification is getting down to a fine point, as it were, and a suggestion, such as has been made, may be at least found worthy of discussion. It may be argued that colors of powders change from many causes; but, while this is true, if a color is mentioned, it should be done in an accurate way.

---

[1] "A Nomenclature of Colors for Naturalists." By Robert Ridgway.

COMPOUND SYRUP OF WHITE PINE.[1]

BY ROBERT S. SHERWIN, PH.G.

Compound syrup of white pine is a very popular expectorant that is used in many parts of this country.

All large manufacturing pharmacists who do not deal solely in specialties manufacture this syrup. Originally the formulas varied somewhat. One of these older formulas was as follows, for one fluid ounce:

White pine bark	20 grains.
Ipecac	15 "
Chloroform	4 minims.
Morphine acetate	3/8 grain.

The names of the ingredients that I selected to manipulate were taken from the label of a large manufacturing pharmacist. His syrup, from the information I have obtained, has by far the widest sale.

According to the labels on a number of different syrups, the ingredients are practically identical.

I have found that the white pine bark that is used in this preparation should be taken from those parts of the limbs or trunk on which either little or no cork formation has taken place, as those parts contain the most oleoresin.

The bark from the older parts of the tree, and especially that from old trunks, contains practically no oil and very little resin; it is composed almost entirely of cork. This older, corky bark is all that I have been able to obtain from different wholesale druggists. When making this syrup I collected the bark myself. I have found that it is collected more easily in the spring of the year than in the late summer or fall. I have made the syrup from both the fresh and dried bark, and find the dried to be not only more easily manipulated, but also to afford a better preparation. In preparing the syrup I use the sulphate of morphine. The hydrochlorate may be used, and the acetate is used by some manufacturers; the latter, however, is not so invariable in quality as the sulphate. I use one-half the quantity of chloroform that is stated on the labels of the various manufacturing pharmacists, yet my finished product contains more chloroform than any of the commercial samples that have

[1] Abstracted from a thesis presented to the Philadelphia College of Pharmacy.

come into my hands. Therefore, the manufacturers either do not put in as much as they state or it is lost by evaporation before it reaches the retail trade. All of the samples of the syrup on the market which I have examined contain coloring substances. I made my first lot of syrup by exhausting the drugs with a hydro-alcoholic menstruum, and dissolving the morphine sulphate, chloroform and sugar in the medicated percolate. This procedure yielded an unsatisfactory product, yet it was very much like the numerous syrups on the market. In a second attempt I exhausted the drugs with a menstruum composed of 2 parts of glycerin and 1 part of water, and dissolved the morphine, chloroform and sugar in the medicated percolate. This method gave a better product than the first did, but it was not as satisfactory as the preparation yielded by the following plan, which has given the best results so far:

White pine bark, Wild cherry bark, of each	65·0	grammes.
Balm of Gilead buds, Spikenard root, of each	8·7	"
Sanguinaria root	6·5	"
Sassafras bark	4·4	"
Morphine sulphate	0·4	"
Chloroform	4·0	c.c.
Glycerin	150·0	"
Sugar	700·0	grammes.

Water, a sufficient quantity to make 1,000 cubic centimetres.

Mix the glycerin with 300 cubic centimetres of water. Having mixed the white pine bark and other vegetable drugs, reduce them to a No. 40 powder. Moisten the powder with a sufficient quantity of the menstruum, and allow it to macerate for twenty-four hours; then pack it firmly in a cylindrical glass percolator, and gradually pour on the remainder of the menstruum. When the liquid has disappeared from the surface, follow it with water, continuing the percolation until 500 cubic centimetres are obtained. Dissolve the morphine sulphate and chloroform, and then the sugar, in the percolate by agitation without heat, strain and pass enough water through the strainer to make the product measure 1,000 cubic centimetres.

Each 30 cubic centimetres of the product represent:

White pine bark	2·000	grammes.
Wild cherry bark	2·000	"
Balm of Gilead buds	0·250	"
Spikenard root	0·250	"
Sanguinaria root	0·180	"
Sassafras bark	0·120	"
Morphine sulphate	0·012	"
Chloroform	0·120	c.c.

The foregoing process makes a beautiful, bright and permanent preparation, that may be given in doses of from one to three teaspoonfuls.

This syrup is as easily prepared as syrup of wild cherry. It costs less than $1 per gallon, while those brands on the market are sold for about $3.50 per gallon. It can be put up in bottles holding 4 fluid ounces, and syrup, bottles, corks and labels need not cost over 60 cents per dozen.

Inasmuch as the compound syrup of white pine is used over such an extensive territory, and its sale in some parts of this territory is so enormous, I am of the opinion that there should be a formula for its preparation in the National Formulary. I believe the compound syrup of white pine is now used much more than a number of preparations which are now recognized in the National Formulary.

Since Mr. Sherwin's thesis was deposited with the Faculty of the College, we have received a copy of the new and revised edition of the National Formulary, and find that compound syrup of white pine is recognized therein under the title of Syrupus Pini Strobi Compositus. We print the formula in full, so that comparison with Mr. Sherwin's formula may be easily made.

White pine bark (Pinus Strobus)	75	grammes.
Wild cherry bark	75	"
Spikenard root	10	"
Balm of Gilead buds	10	"
Sanguinaria root	8	"
Sassafras bark	7	"
Morphine sulphate	0·5	"
Chloroform	6	c.c.
Sugar	750	grammes.
Alcohol	—	
Water	—	

Syrup (U. S. P.), of each a sufficient quantity to make 1,000 cubic centimetres.

Reduce the vegetable drugs to a moderately coarse (No. 40) powder, moisten the powder with a menstruum composed of 1 volume of alcohol and 3 volumes of water, and macerate for twelve hours. Then percolate with the same menstruum until 500 cubic centimetres of tincture have been obtained, in which dissolve the sugar and the morphine sulphate; lastly, add the chloroform and sufficient syrup to make 1,000 cubic centimetres, and strain.

We have not had experience with the Formulary process, which involves the use of alcohol in the menstruum for the extraction of the drugs, but we know a highly satisfactory preparation can be made by the use of water and glycerin.—*Editor.*]

THE VOLATILE OIL OF CICUTA MACULATA.[1]

By Freeman P. Stroup, Ph.G.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy, No. 153.

The boiling points of the several fractions of the oil were taken in a thin test tube placed in a sand bath, and containing just enough of the oil to immerse the bulb of the thermometer, the temperature being noted when the oil was in active ebullition. The specific gravity of the original oil was taken by means of a pyknometer, with the oil at a uniform temperature of 15° C. The specific gravities of the several fractions, owing to the small quantity of each that was obtained, were taken at 15° C., by means of an improvised bottle, and are, necessarily, only approximately correct. The various distillations and rectifications were conducted under the ordinary atmospheric pressure. The distillations necessary for fractioning the oil were conducted from an ordinary fractioning bulb over a sand bath, with a thermometer inserted in the well-fitting cork in such a manner that its bulb was on a level with the junction of the neck of the flask with the body.

At first a condenser was employed, but it was afterwards found that the fractions could be distilled from one bulb into another without its use. With the condenser it seemed impossible to get rid of all traces of water, even by repeated agitation of the oil with anhydrous calcium chloride and subsequent re-distillation. This trouble was not experienced after the condenser was discarded.

The combustions were conducted in an open tube with cupric oxide and a stream of oxygen. The vapor densities were taken by means of the Victor Meyer apparatus, and all necessary corrections for variation in temperature and barometric pressure were made in the usual way.

The quantity of oil obtained from the amount of drug obtainable was so small that it was deemed advisable not to test it as a whole, but rather to split it into its component parts, and, if possible, ascertain its chemical composition, especially as the oil had been pretty thoroughly described as a whole by Jos. E. Young, in this journal,

---

[1] Literature.—Jos. E. Young, Am. Jour. Pharm., July, 1855; and Robert Glenk, Am. Jour. Pharm., July, 1891.

for July, 1855, and by Robert Glenk, *ibidem*, July, 1891. From their writings I make the following extracts:

Essay by Joseph E. Young.—"One pound of the bruised seeds were distilled with water, acidulated with sulphuric acid; 7 per cent. of a colorless, very limpid, volatile oil passed over, having an insipid, oily taste, and an odor very analogous to that of Chenopodium anthelminticum; has a specific gravity of ·853, and boils at 360° F., without undergoing any change; is soluble in alcohol, ether and chloroform; it dissolves a large quantity of sulphur by heat, and deposits most of it in crystals on cooling; phosphorus is also readily taken up by the oil with the aid of heat, and also crystallizes on cooling; sulphuric acid decomposes and blackens the oil with evolution of heat; muriatic acid gas passed through it is largely absorbed, and decomposes the oil, changing its color to a dark brown without any deposition of resin; and the same reaction takes place with chlorine.

"Nitric acid acts on it powerfully. When added to the oil an explosion follows by which most of it is thrown from the vessel; the residue, on standing a few hours, deposits a thick, resinous matter, heavier than water, which, when well washed with warm water and distilled with potassa, afforded a substance having a very agreeable aromatic odor.

"The volatile oil of Cicuta maculata is neutral to test paper, but rapidly ozonizes air enclosed with it in glass bottles exposed to light, and in this respect it is more active than oil of turpentine. The corks of the vials containing it are bleached as though acted on by nitric acid, and when a strip of paper moistened with iodide of potassium and starch water is suspended in a vial above the oil, the iodide is instantly decomposed, setting free the iodine. When treated with bichromate of potassium and sulphuric acid, it yielded by distillation an acid analogous to formic acid.

Potassium, when added to the oil, decomposes it with effervescence, materially affecting its odor, and, on standing, causing it to become solid, the potassa formed from the oxidation of the potassium uniting with a portion of the oil to form a compound like resinate of potassium having a dark brown color and a soft consistence.

"About 2 drachms of the oil were treated with potassium until reaction ceased, when it had assumed a dark brown color and a soft consistence; the whole with a portion of potassium was introduced into a retort, and, by a careful application of heat, a colorless hydrocarbon oil distilled over, of the specific gravity ·830, and having a pleasant odor and a bland aromatic taste; it is rendered dark red by the action of sulphuric acid; caustic potassa digested in the oil does not affect it; nitric acid acts on it with effervescence, but without exploding; iodine combines slowly but perfectly without explosion, becoming colorless on standing."

Essay by Robert Glenk.—"The volatile oil obtained by distilling the bruised fruit with water was first of a dark color, but, on redistillation, was obtained nearly colorless; yield, 4·8 per cent.; specific gravity, ·855; boiling point, 177° C. (350° F.); soluble in 1·5 parts commercial alcohol, in all proportions of absolute alcohol and in 50 parts of glacial acetic acid.

"The following color reactions were observed: a solution of bromine in

chloroform (1 : 20) gave a brownish color ; a strong alcoholic solution of hydrochloric acid colored a reddish-violet ; sulphuric acid (6 drops to 1 drop of oil) became immediately dark brown ; fuming nitric acid on a solution of the oil in carbon disulphide gave a brownish tint ; solid iodine added to the oil dissolves slowly ; picric acid on warming dissolves with an orange color."

So much can be said for existing literature on the subject. The drug used in the preparation of the oil employed in the following experiments consisted of about 2·5 kilogrammes of material, left in the care of Professor Trimble in 1891, by Robert Glenk, who had made an exhaustive study of the proximate principles of the drug.

Upon assorting the material, about 1·5 kilogrammes of clean fruit were obtained, the remainder consisting of stems, umbels, partly developed fruit, and adhering dirt. The refuse was first macerated with water over night, and then distilled, yielding by its distillation a small quantity of a light amber-colored oil. The water which came over with the oil was poured upon some of the clean fruit, more water added and the whole allowed to macerate over night. It was then distilled, the water that came over with the oil being from time to time returned to the still. The oil was carefully separated from the water and dried by agitation with anhydrous calcium chloride. The product was of a light amber color and equalled 3·82 per cent. of the drug used. Mr. Glenk's larger yield was probably due to the fact that the fruit he used was fresh, and therefore had not deteriorated through exposure to the air. The specific gravity of the freshly obtained oil was found to be ·8839. The oil was now rectified. The bulk of the distillate came over between 177° and 184° C., the last portion coming over at 225° C. The first portions came over colorless and limpid, the last portions slightly yellow and generally accompanied by some whitish-appearing particles, which disappeared when the oil stood undisturbed for a short time. The same behaviors were noticed in several subsequent rectifications, but the cause was not ascertained. The distillate was again agitated with calcium chloride and several times redistilled. Its specific gravity was again taken and found to be ·8766, showing a decrease as compared with the gravity of the original oil. Traces of moisture were still noticed, and it was found necessary to alternately agitate it with dried calcium chloride, and redistil three or four times before the last trace of moisture disappeared. The specific gravity was then found to be ·8728. Mr.

Glenk left with the fruit used in these experiments about 15 c c. of oil which he had isolated in 1891. This was redistilled and was then found to have the same general characteristics as the fresh oil; so it was mixed with the latter, and the whole afterwards fractioned as one lot. Great difficulty was experienced in obtaining fractions with constant boiling points, but it is believed that those given below are as nearly the correct fractions of the oil as can be obtained by fractional distillation alone. Nearly all of the fractions were cloudy when first collected, but afterwards became very clear. As mentioned above, this phenomenon could not be accounted for. The four fractions were neutral toward litmus paper. The decomposition products that were obtained above these fractions were acid toward that substance. Prolonged chilling did not serve to separate solid bodies from the oil or its fractions.

Number of fraction.	Temperature at which obtained.	Approximate percentage by volume.
1	176° to 178·5° (average 177°)	40
2	178° to 183° (average 179°)	35
3	180° to 190°	7
4	190° to 223°	4
5	225° (decomposition products)	4
6	Above 225° (residues)	6
7	Residues from first rectification	4

DESCRIPTIONS OF FRACTIONS.

No. 1: Colorless, limpid, very transparent oil, with strong, but not unpleasant, somewhat aromatic odor. Boiling point, 177·5° C. Specific gravity, ·8563.

No. 2: Description same as No. 1. Boiling point, 179·5° C. Specific gravity, ·8599.

No. 3: Colorless, limpid, very transparent, with strong, disagreeable odor. Boiling point, 181° C. Specific gravity, ·8664.

No. 4: Nearly colorless, limpid, transparent, with strong, unpleasant odor. Boiling point, 185° C.

No. 5: Brilliant, transparent, dark amber in color, odor empyreumatic. Boiling point above 200° C. When this fraction was being obtained, the temperature fell rapidly from 225° to 150°, thus indicating decomposition.

No. 6: Heavy, transparent; color, dark mahogany; odor, strongly empyreumatic.

Nos. 1, 2 and 3 seem to be the most important fractions, and this treatise has to do mainly with the consideration of their properties; however, some tests were made on some of the other fractions, and these will be mentioned in their proper places.

Nos. 6 and 7 were treated with alkali in order to ascertain if they were esters, but with negative results.

Strips of filter paper, moistened with potassium iodide solution and starch water and suspended above the oil in the tubes containing Nos. 1, 2 and 3, rapidly turned purple, showing the presence of a considerable amount of ozone in the air confined with the oil. The corks of these tubes became quite white in color, having been subjected to the bleaching action of the ozone produced by the oil. A few drops of each of the fractions were placed in clean, dry test tubes, and enough glacial acetic acid added to each to effect solution. This was followed in each case by the addition of a few drops of strong sulphuric acid. The following phenomena were noticed: No. 1 assumed a reddish-brown color; Nos. 2, 3 and 4 became dark purplish-red; Nos. 5 and 6 became dark purple. Upon heating, all became nearly black, and, upon cooling, became denser in consistency, Nos. 3, 4, 5 and 6 becoming quite gelatinous. Upon standing for forty-eight hours, Nos. 5 and 6 became solid. Upon longer standing, each separated into two layers, the bottom layer in each case being of a dirty brown color, and the upper layer of a purplish hue. Of the fractions themselves, Nos. 1, 2, 3 and 4 each decolorized an ethereal solution of bromine. Nos. 1 and 2 each violently decomposed strong nitric acid, and also reacted with a mixture of strong nitric acid and alcohol with almost explosive violence. Nos. 1, 2, 3 and 4 showed no change of color with a solution of ferric chloride in absolute alcohol, but No. 5 gave a dark red color. Nos. 1, 2 and 3 dissolved iodine quite readily, but not with violence, Nos. 1 and 2 decolorizing the iodine solution upon standing for some time. All of the fractions were soluble in an equal bulk of glacial acetic acid. Nos. 1, 2 and 3 were also soluble in equal bulks of commercial alcohol, acetone and ether; and in all proportions in benzin, benzol, chloroform and carbon disulphide. They were but slightly, if at all, soluble in glycerin. As most of these reactions and solubilities correspond with those of the class of

compounds called terpenes, we might almost arrive at the conclusion that these bodies are what we have in this oil. Five cubic centimetres of No. 1 were shaken with 10 c.c. of a mixture of strong sulphuric acid and water (2 : 1), to attempt to polymerize the terpene if possible. The mixture was then distilled in a current of steam, 3 c.c. of a yellow oil distilling over with the water. This oil was again shaken with about 10 c.c. of a mixture of strong sulphuric acid and water (4 : 1), and again distilled as above. The volume of oil that distilled over was much less than before. That which came over was colorless and responded to the tests applied to the original fraction, except that its action with nitric acid was not violent, although the oil was darkened somewhat by the acid. Nos. 1, 2, 4, 5 and 6 were each treated with an equal volume of a strong solution of sodium bisulphite and agitated occasionally during two days, and then allowed to stand for eighteen hours. Upon careful examination, no crystals indicative of the presence of either aldehydes or ketones could be detected in any of the samples. Combustions were now made upon fractions 1, 2, 3 and 4, in order to determine their chemical compositions.

The results justify the assertion that all are terpenes, but with slightly different boiling points. Vapor densities taken of portions of No. 2 seemed to confirm this idea, at least as far as this fraction is concerned. As the fractions resembled one another in so many other points, it was not deemed necessary to ascertain the vapor densities of more than this one fraction.

The following were the results of the eight combustions which were made :

	Fraction I.		Fraction II.	
Carbon	88·21	87·90	88·30	88·72
Hydrogen	12·07	11·29	11·40	11·77

	Fraction III.			Fraction IV.
Carbon	85·84	86·86	87·17	82·46
Hydrogen	10·91	11·45	10·14	10·33

The theoretical percentages of carbon and hydrogen in the terpene $C_{10}H_{16}$ are 88·23 and 11·77, respectively. It is known to the author that the amounts of carbon found in fractions 3 and 4 are lower than the truth. The wide range of temperature observed in the distillation of No. 4 tends to cause a doubt in my mind as to its being a distinct fraction. If it were a decomposition product, as the

variation in the temperature of distillation seemed to indicate, it certainly must have been a terpene if we judge from the combustion result.

Four trials were made on No. 2, in order to ascertain its vapor density. The results compared with air were 5·09, 5·24, 4·38 and 5·09. The theoretical density of $C_{10}H_{16}$ is 4·70, and that for $C_{15}H_{24}$ is 7·07.

Recapitulation.—The results of this investigation of the chemistry of the volatile oil of Cicuta maculata may be summed up in the following words:

The oil is composed mainly of two fractions, both terpenes, boiling respectively at 177·5° and 179·5° C.; and in addition to these are two smaller fractions, also terpenes, boiling at 181° and 185° C., respectively, and a number of smaller fractions of undetermined chemical composition, having nearly all the physical characteristics of the terpenes of the general formula $C_{10}H_{16}$

Both the oil and its fractions are readily soluble in commercial alcohol, acetone, ether, benzin, benzol, chloroform and carbon disulphide. They are insoluble in water and glycerin.

The oil and each of its two principal fractions react violently with strong nitric acid, and quietly with iodine, producing a colorless solution.

With a larger quantity of material to work upon, some future investigator may be able to prove the presence of some other substances in this oil besides terpenes; but from all the observations made during these investigations the writer is prone to believe that it is simply a mixture of terpenes with possibly a small trace of an oxygenated compound.

A CONTRIBUTION TO THE KNOWLEDGE OF SOME NORTH AMERICAN CONIFERÆ.

By Edson S. Bastin and Henry Trimble.

(*Continued from page 210.*)

THE TURPENTINE INDUSTRY.

The resinous products of the Coniferæ and their derivatives are known in commercial circles as *naval stores.* This industry has been carried on in the Southern United States for about two centuries. The following historical data are of considerable interest, and are taken in part from Bulletin No. 5 of the North Carolina

Geological Survey,[1] and in part from the Report of B. E. Fernow, Chief of United States Forestry Department, for 1892:

"As early as 1700 the production of naval stores was an industry of some importance in the Colony of Carolina. At the same time the industry was carried on in the adjacent parts of Virginia. In Virginia the products were largely derived from the loblolly pine, while in North Carolina they came from the long-leaf pine. The products exported from the Colony at that time were tar and pitch, and some crude turpentine; but the quantity of the latter shipped was small. Tar kilns were made then as now, and the process of burning was the same. Indeed, the process is very much the same as that described by Theophrastus as being used by the ancient Greeks.

"Until about 1800 the making of tar was not as largely confined to North Carolina as it is at present, nor even to the Southern States. Besides being burnt in Virginia from the loblolly and short-leaf pines, some was made in New York and other Northern States from the pitch pine (Pinus rigida), but more for home use than for export.

"In the three years—1768 to 1770—88,111 barrels of crude turpentine, 20,646 barrels of pitch and 88,366 barrels of tar were on the average annually exported to the mother country, representing a value of $215,000 in our present currency. In its infancy the manufacture of naval stores was confined to the district between Tar and Cape Fear Rivers, with Wilmington and Newberne for shipping ports. Most of the crude resin was shipped to England. Later, the distillation of spirits of turpentine was carried on to a small extent in Northern cities as well as in North Carolina. Up to the year 1844, fully one-half of the crude product was subjected to distillation in the latter State, the process being effected in clumsy iron retorts; the introduction of the copper still in 1834 led to a largely increased yield of volatile oil, and this industry received a strong impetus. The number of stills at the ports was increased, and the production grew yet further shortly afterward, caused by the new demand for spirits of turpentine in the manufacture of india-rubber goods, and turpentine orcharding was rapidly extended to the south and west of its original limit. As early as 1832 rectified spirits of turpentine was used for an illuminator, and for that purpose came into general use in 1842, either alone in the rectified state, or mixed with a certain quantity of strong alcohol, under the names of camphene and burning fluid, furnishing the cheapest light until replaced by the products of petroleum. The large consumption of spirits of turpentine in this way caused such an increase in its production that the residuary product, rosin, was largely in excess of the demand, leading to a great depreciation of this article. The consequent reduction of the profits of the business caused the transfer of the still from the place of shipment to the source of the raw material—the forest. From that time (1844) dates the great progress made in the expansion of this industry to the virgin forests farther south, and the turpentine stills increased rapidly in number in South Carolina, Georgia, Florida and the Eastern Gulf States.

"During the war of secession, when the production in the South was stopped,

[1] *The Forests, Forest Lands and Forest Products of Eastern North Carolina*, by W. W. Ashe, in charge of forest investigation, Raleigh, 1894.

the turpentine industry of France received an impetus, and that country supplied, as best she could, the deficiency. Prices went up to five or six times their former range, namely, $25 to $30 per 100 pounds for spirits, and $9 to $10 for pale yellow grades of rosin, $4 to $5 for inferior grades. These prices instigated improvement of methods, such as the Hugues system, described further on, and more careful treatment of the crop.

"With the close of the war the industry revived in the United States, though the demand for turpentine was not as great as formerly, petroleum products of various kinds having been found to take the place of the product of the pine for many purposes."

While the Pinus palustris is the source of the largest proportion of naval stores, still a considerable quantity is yielded by P. taeda, the loblolly pine; P. echinata, the short-leaf pine; and P. Cubensis, the Cuban pine. The product from P. rigida in the North Atlantic States is now a matter of history, the supply from that source having long since been exhausted.

At present the long-leaf pine furnishes the great bulk of the supply, not only for the United States, but for the whole world, the production of France and Austria, the only other producers of naval stores, furnishing hardly one-tenth of the total production. The world's supply amounts in value to something over $10,000,000 annually.

The geographical distribution of the turpentine-yielding pines is very similar to that laid down for Pinus palustris on a previous page, and embraces portions of the following States: North and South Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas and Texas.

Turpentine orcharding[1] is that branch of the naval store industry which is immediately concerned with the collection of the resinous products. It has been found that the trees best adapted to tapping are those not less than 15 inches in diameter and in vigorous growth. Trees over 10 inches in diameter will yield almost double the amount of resin that a smaller tree will produce, and at the same time the resin is much richer in volatile oil. Notwithstanding the fact that younger trees give an inferior yield, yet saplings scarcely over 8 inches in diameter are frequently boxed.

Boxing is the term given to the operation of cutting the cavities or boxes, which are to be the receptacles of the crude turpentine.

---

[1] In addition to the reports referred to, excellent brief descriptions of the turpentine industry may be found in AM. JOUR. PHARM., 1890, p. 284 (Dunwody), and p. 393 (Murray).

The boxes and method of chipping can best be understood by reference to *Fig. 23*, taken from the U. S. Government previously referred to, which shows a boxed and hacked tree, as well as a section of the same in outline. While this illustrates the principle of boxing and chipping in a satisfactory manner, still the appearance of the trees may be better understood from *Figs. 24* and *25*, which are reproduced photographs of sections of trees exhibited at the recent exhibition in Atlanta, and now to be seen at the Commercial Museum, Philadelphia.[1] *Fig. 24* shows the surface of the chipped tree covered with "scrape" about the end of the season, when the resin has ceased to flow. *Fig. 25* shows a tree just after "boxing" and "cornering" in the spring, before the flow has commenced. These boxes are cut during the winter, when no resin is running. The instrument used is a peculiar, long and narrow axe. The lower edge of the box is from 8 to 12 inches above the ground. The greatest diameter of the box, *d* to *e* (*Fig. 23*), is 14 inches; depth, *b* to *f*, 7 inches; width, *b* to *c*, 4 inches; and height, *a* to *b*, 6 to 7 inches. From two to four boxes are cut in a tree, according to its size.

With the advent of spring, about the 1st of March, the resin begins to flow, and active operations commence. *Cornering* is first effected; this consists in removing the bark and the youngest layer of wood from two triangular spaces immediately above the box to a height of about 10 inches. The resin exudes rapidly on warm days and flows into the box. In the course of eight or ten days the surface becomes clogged, and two diagonal cuts or hacks are made so as to expose a fresh surface; this is accomplished by a peculiar instrument, termed a *hacker* (*Fig. 26*), which consists of a curved knife attached to an iron or wooden handle, bearing at the opposite end an iron ball weighing about 4 pounds. The momentum given by the heavy ball enables the skilled workman to make the two diagonal cuts with two blows. These *hacks* are made every eight or ten days from March to October, or sometimes until the middle of November. The height of the chipped surface is increased from 1½ to 2 inches

[1] Our thanks are hereby tendered to Dr. Charles Schäffer for these photographs, as well as the one illustration of the Schuler system in this same contribution; also, to Dr. William P. Wilson, Director of the Philadelphia Commercial Museum, for the special effort on his part to have the exhibit set in place, in order that the illustrations might be ready for this article.

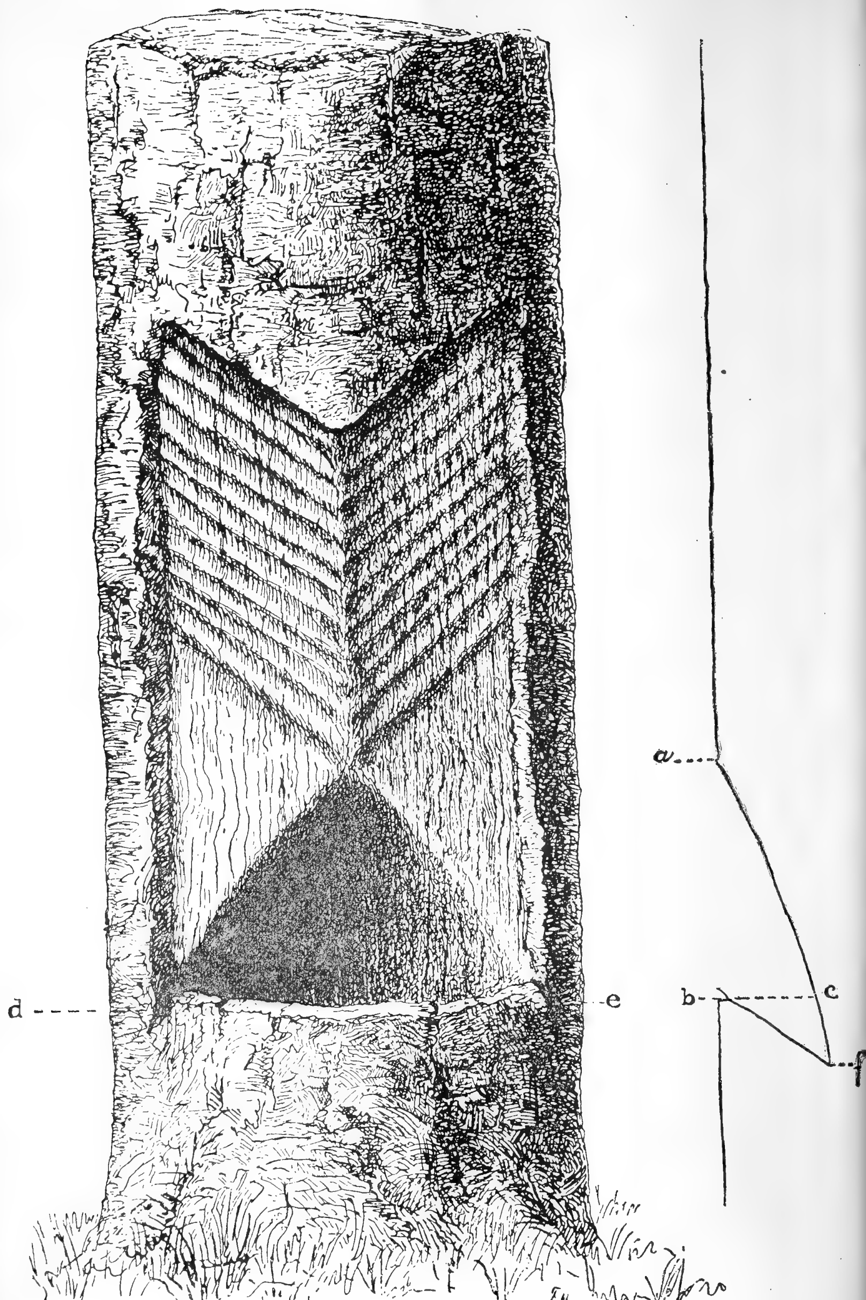


Fig. 23.—A boxed, cornered and chipped tree.

Fig. 24.—A boxed, cornered and chipped tree covered with *scrape*.

Fig. 25.—A boxed and cornered tree.

every month. The flow of resin is most abundant during June, July and August, decreasing as the cooler weather approaches.

The resin which accumulates in the boxes the first season is known as *virgin dip*, and is removed by a flat *dipper* to barrels for transportation to the still. On an average, seven dippings or collections are made the first season of about thirty-two weeks. About 40 barrels of crude resin (soft gum) is obtained from 10,000 boxes at each dipping. The net weight per barrel is about 240 pounds. As the flow of resin diminishes it hardens on the surface; this is then removed with the *scraper* from the face of the tree. The product is known as *scrape* or hard turpentine, and it is decidedly of inferior quality to the *dip*. It is of a dingy white color, contains particles of wood, bark and dust, and yields only about half the volatile oil obtained from the dip.

In the first season the average yield from 10,000 trees of dip amounts to 280 barrels, and of scrape to 70 barrels. The former yields 6½ gallons of spirit of turpentine to the barrel of 240 pounds net, and the latter 3 gallons to the barrel, resulting in the production of 2,000 to 2,100 gallons of spirit of turpentine, and 260 barrels of rosin of the higher and highest grades.

In the second year from five to six dippings are made, the crop averaging 225 barrels of soft turpentine, while the scrape is increased to 120 barrels, making altogether about 2,000 gallons of spirit and 200 barrels of rosin ; the latter is of a lighter or deeper amber color, perfectly transparent and of medium quality.

In the third and fourth years the number of dippings is reduced to three each. The freshly hacked surface is so much higher, causing the resin to flow over so much more surface, that comparatively little reaches the boxes. In the third season the dip amounts to 120 barrels, and the scrape to 100 barrels, yielding about 1,100 gallons of spirit and 100 barrels of rosin of a more or less dark brown color, and not quite transparent.

In the fourth and last year the yield of dip is somewhat less than that of the previous year, while the scrape remains about the same, 100 barrels, yielding in all about 800 gallons of spirit and 100 barrels of the lowest grade of rosin, which is opaque, heavy and of a deep brown, almost black, color.

Owing to the reduction in the quantity and quality of the raw product, it is not considered profitable by the larger operators to

work the trees for a longer time than four years. In North Carolina, the smaller land owners work their trees for eight to ten successive seasons or more, protect the trees against fire, and after giving them rest for a series of years apply new boxes on spaces left between the old boxes with good results; this operation is known as *reboxing* or *back-boxing*.

The process of turpentine gathering, as just described, and as at present carried out, is almost as wasteful a one as could be devised. The loss by evaporation of the volatile oil alone is an enormous one. To this may be added the rapid destruction of the tree for turpentine purposes, and the loss by fire to which the larger surface of flowing resin offers especial attraction.

The resin taken from the long-leaf pine at least comes from the sapwood alone, the heartwood being impregnated with non-fluid oleoresin, which does not contribute towards the flow. The resin tapped is not only that which was deposited in the sapwood in former years, but also that which is formed during the years of tapping by the growth of the tree; hence, sufficient amounts of active cambium and young wood should be left untouched to permit a plentiful supply of water from the ground to maintain the foliage in vigor.

Various suggestions have been made to accomplish the collection of the resin in accordance with the conditions just mentioned, and at the same time prevent the waste which attends the American system as at present conducted. The Hugues system, as conducted in France, possesses many advantages, but the expense of adopting it in this country, and the fact that cups are required instead of boxes, have operated against it. The important advantages of the French system are that the chipping is more slowly and carefully conducted, that this chipped surface is only 3 to 5 inches in width, instead of 12 to 14 inches as with us, and that the products are collected by means of a lip or trough and a cup, in order to exclude pieces of bark and other foreign matter, and to reduce the loss by evaporation to a minimum.

At the recent Cotton States and International Exposition in Atlanta, an exhibit was made in the U. S. Division of Forestry, of a process patented by Mr. J. C. Schuler, by which no boxes are cut, but a cup of iron or earthenware was substituted. This process may be understood by reference to *Fig. 27*.

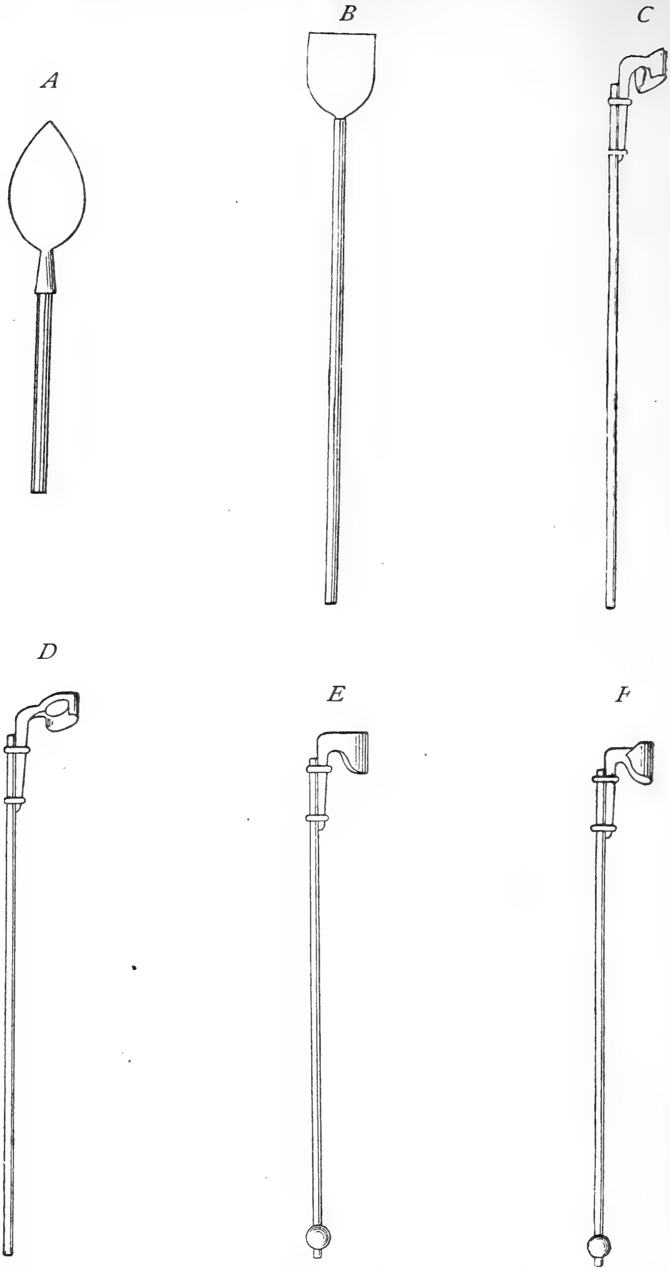


Fig. 26.—Tools used in turpentine orcharding: *A*, dipper; *B*, pusher; *C* and *D*, scrapers; *E*, closed hacker; *F*, open hacker.

The results claimed are a largely augmented yield and a much purer product. Conversation with a number of turpentine gatherers, however, indicated that they would not accept any system which involves the use of cups, since the first cost is not the only outlay, but the additional expense occasioned by wear and tear almost prohibits their use.

Dr. Charles Mohr, of Mobile, Ala., special agent for the U. S. Division of Forestry, has been inclined to look with favor on this process, although he confesses his inability to decide after only a

Fig. 27.—The first cut in the tree by the Schuler process.

season's observation of its working. The following is from a communication from Dr. Mohr concerning it:

"Schuler *admits* that the first cost for providing the cups, putting them up and removing them the second season, raises the expense of working a crop of 10,000 cups for two seasons to $460, against $190 for cutting 10,000 boxes, expended under the old system in working one crop for two seasons; all other expenses connected with the work being considered equal. On the other hand, Schuler *claims* that the difference is vastly overbalanced by the increased yield of crude turpentine obtained by his cup methods, amounting for one crop

worked two years to 195 barrels, at $3.50 per barrel; after deducting the extra expense involved by his method, this would leave a net balance of $410 per crop in favor of the cup system. He further claims that this amount is still further augmented if the larger quantity of spirit of turpentine and the higher quality of rosin obtained from the dippings under his system are taken into account. On the first point he says that fully one-eighth of the crude turpentine brought to the still from the boxes consists of chips, sand and other foreign matter, contaminations from which the product of the cups is entirely free. On the second point he refers to the high grades of rosin resulting from the distillation of the crude turpentine from the cups, which almost entirely classes with the highest and higher grades."

Apparently the question of systems resolves itself into one of boxes or cups. It is a matter against trouble and expense, and it is doubtful whether any other than the present system will be adopted until scarcity of material drives the producers into more economical methods.

The process of dipping the turpentine from the boxes has been described; these dippings are first collected in buckets, which are emptied into barrels in wagons and conveyed to the stills.

The distillation of turpentine is effected in copper stills set into brick furnaces. The still usually holds from fifteen to twenty barrels of the crude resin. With this "crude" a little water is added, and the whole is then warmed so as to allow the chips, straw and other light impurities to rise to the surface and be removed as far as possible. The top is then luted on and connected with a large condensing worm in a tank of cold water. When all the joints have been made tight, heat is applied strongly and the distillation commences. Water predominates in the first portions of the distillate, but soon a nearly pure oil is collected. In most cases water is run in during the process, in order to prevent the resin from becoming too thick and charring. The spirit of turpentine is dipped off from the surface of the water and run into barrels, or in some cases into oil tank cars. The residue in the still, while yet in a molten state, is run off by a faucet through three strainers of wire cloth, and then into barrels; this constitutes the commercial rosin. The rosin from the first year resin is rated in commerce as W. W. (water white) and W. G. (window glass). That from the second year's yield is classed N. M. K., etc.

The following facts concerning yield, taken from the U. S. Government Report, previously referred to, indicate just how the

products are classified; at the same time they show how enormously destructive the industry is at the present time:

"It appears that the yield of the crop of 200 acres distributes itself about as follows:

	Dip.	Scrape.	Total Crude Turp'ntine.	Total Yield.	Scrape.	Spirits.		Rosin.
	Pounds.	*Pounds.*	*Pounds.*	*Per Ct.*	*Per Ct.*	*Gallons.*	*Per Ct.*	*Barrels.*
First year	67,200	16,800	84,000	30·9	20·0	2,100	34·4	260
Second year	54,000	28,800	82,800	30·5	34·8	2,000	32·8	200
Third year	28,800	24,000	52,800	19·5	45·5	1,100	18·0	100
Fourth year	28,000	24,000	52,000	19·1	46·1	900	14·8	100
Total	178,000	93.600	271,600	100·0	34·1	6,100	100·0	660

"If we assume that 4.500 trees produce these amounts in four years, the yield per tree in crude turpentine is about 60 pounds. The result at the still would indicate that each tree furnishes between 1¼ and 1½ gallons of spirit and ⅛ of a barrel, or 30 pounds, of rosin of better grade, or at best 75 cents' worth of product during the four years, which it has cost 55 cents to produce, leaving 5 cents net per tree per year, or from $1 to $1.25 per acre.

"From the fact that 4,000 acres of timber land (20 crops of 200 acres each) during four years' working produce 120,000 gallons of spirit of turpentine, or 7½ gallons per acre and year, it follows that to produce the 17,000,000 gallons reported as the annual product, not less than 2,250,000 acres must be in orchard; and since the yield of the first year represents 35 per cent. of the total annual yield, at least 800,000 acres of virgin forest are newly invaded annually to supply the turpentine stills in operation."

TAR.

Tar was one of the earliest pine products manufactured in the American colonies. In the South it was commonly converted into pitch before being shipped, by the addition of some crude turpentine and boiling down to the proper consistency. In the North considerable quantities were also produced from Pinus rigida.

Tar, as found and used in the United States, is the product of the incomplete combustion of the fat pine, Pinus palustris, and some other species of pine[1].

North Carolina produces most of the tar exported from this country, although small quantities, especially for home consump-

[1] Dunwody, AM. JOUR. PHARM., 1889, p. 600.

tion, are manufactured in South Carolina, Georgia and several other of the Southern States. Pharmacists and others who wish small quantities of tar for home consumption, wedge a number of small billets of the wood into an iron pot, ignite it and invert the whole over another iron pot, into which the tar drops and collects as the upper vessel becomes heated. Another method consists in placing a number of ignited billets at the top of an inclined plane of sheet iron; the tar runs down and is collected in a suitable vessel.

On a large scale, the wood is cut into lengths of 2 or 3 feet, split into billets, and arranged on end in a cavity in the earth, prepared so the bottom slopes to a gutter or to an iron trough or pipe. The upper ends of the billets are covered with bark and then with clay. A fire is built on top of the whole, using poor and decayed wood. When the whole becomes sufficiently heated, tar runs from the iron pipe or trough and is conveyed into suitable barrels. The annual output of tar in North Carolina, which produces the great bulk of this product, is not far from 60,000 barrels, valued at something over $1 per barrel.

[*To be continued.*]

A MENSTRUUM FOR FRESH KOLA NUTS.

BY J. HENRY SCHROEDER, PH.G.

Ever since Mr. Kilmer read his interesting paper on kola, at the Pharmaceutical Meeting of the Philadelphia College of Pharmacy, in January,[1] many inquiries have been made regarding the best menstruum for exhausting kola. In order to obtain some light on this question, Prof. Frank G. Ryan, of the Philadelphia College of Pharmacy, has made extractions of the drug, with different menstrua, as follows:

I. 100 grammes of the fresh, red nuts were finely sliced, and extracted by macerating with 200 c.c. of alcohol and 2 c.c. of acetic acid, during four weeks. The product was reddish brown in color, and had the characteristic taste of fresh kola nuts, somewhat astringent.

II. 100 grammes of the fresh, white kola nuts, finely sliced, were extracted, as stated before, with 200 c.c. of diluted alcohol and 2 c c. of acetic acid. The product was somewhat darker in color than

[1] See AM. JOUR. PHARM., February, 1896, p. 96.

that extracted with strong alcohol, but had about the same physical properties.

III. 100 grammes of the red and white fresh kola nuts, finely sliced, were macerated during four weeks, with a menstruum of 160 c.c. alcohol, 40 c.c. glycerin, and 2 c.c. of acetic acid.

This preparation also had an astringent taste, characteristic of the kola nut. Upon standing for about a week, it showed signs of cloudiness, and deposited a slight sediment.

Duplicate assays of each of these preparations yielded the following amounts of total alkaloids for 100 c.c. of the preparation, equivalent to 50 grammes of drug.

I.	0·33 0·36	average	0·345 grammes.
II.	0·43 0·45	average	0·440 grammes.
III.	0·40 0·37	average	0·385 grammes.

In order to determine whether hydrolysis would increase or decrease the yield of total alkaloids, a portion of I was hydrolized by heating in a reflux condenser, with 1 per cent. hydrochloric acid, during one-half hour. On assaying the product, I found it to yield 0·370 gramme of total alkaloids in 100 c.c., showing that the yield of alkaloids had not been affected by heating with an inorganic acid.

The above assay was conducted on 10 c.c. of the preparation, by Lloyd's method, and the figures represent the amount of purified alkaloids.

The chloroform extracts from the original preparation some fatty matter, and purification of the alkaloids had, therefore, to be resorted to.

It will be seen that diluted alcohol and 2 per cent. of acetic acid extracted the largest amount of total alkaloids.

In this connection it may be of interest to note Nathan L. Thompson's contribution to the AMERICAN JOURNAL OF PHARMACY, 1895, p. 518, wherein he reported that fresh kola nuts contain 56·65 per cent. of water and 0·75 per cent. of caffeine and theobromine, indicating that by Professor Ryan's processes the drug was completely exhausted of its total alkaloids. The taste and other characters of the marc indicated thorough exhaustion.

PHILADELPHIA, PA., April 14, 1896.

SOLUTION OF CITRO-PHOSPHATE OF SODIUM.

BY WILLIAM C. WESCOTT, PH.G.

Sodium phosphate has long been known as a hepatic stimulant and purgative, when given in doses of 1 or 2 drachms; and within a year or so there have been placed on the pharmaceutical market of the United States several preparations which are stated to be solutions of sodium phosphate. One of these solutions is known as "Melachol," and its advertisement claims every fluid drachm of it to contain 85 grains of the combined sodium phosphate, citric acid and sodium nitrate. The other solutions are said to contain from 60 to 85 grains of sodium phosphate in each fluid drachm. The United States Pharmacopœia, in describing sodium phosphate, says: "when heated to about 40° C. the salt fuses, yielding a colorless liquid;" and it is well known that, on cooling, the liquid congeals to a crystalline mass. The official statement of solubility reads: "soluble in 5·8 parts of water at 15° C., and in somewhat less than 1·5 parts of boiling water;" and Mulder, in 1864, gave the solubility as 1 in 2·5 parts of water at 30° C.

Thus we see that these solutions are said to contain more sodium phosphate than could be kept in solution in water at ordinary temperatures, and that permanent liquefaction by heat is impossible. Therefore, if the sodium phosphate is the chief medicament and the other substances are of minor importance as medicinal agents, they must be used either to help make it possible to get so concentrated a solution of sodium phosphate, or to mask the alkaline taste of the latter, and thereby render it more acceptable. In order to ascertain whether such a concentrated solution of sodium phosphate could be prepared, the writer made some experiments with the three substances. He has found that 100 parts of sodium phosphate and 10 parts of citric acid, when shaken or triturated together, liquefy; that 100 parts of sodium phosphate and 5 parts of sodium nitrate under the foregoing conditions become semi-solid; and that 5 parts of sodium nitrate can be added to the liquid resulting from the mixing of the sodium phosphate and citric acid without causing it to solidify.

The solution that was found to correspond in specific gravity, acidity (titrated as citric acid) and amount of phosphoric anhydride to "Melachol," was the product of the following formula:

	Grammes.
Sodium phosphate, crystallized	100
Sodium nitrate	2
Citric acid	13

Triturate the substances until they liquefy, and add enough water to make 100 c.c. This liquid and also those prepared from other quantities of these materials retained their state of aggregation at ordinary temperatures, and even when cooled to 10° C., unless agitated; then small crystals separated. These crystals redissolved at 20° C.

ATLANTIC CITY, N. J., April 20, 1896.

[In the *Pharmaceutical Era* for April 9, 1896, John M. Tobin states that a solution of phosphate of sodium may be made so that each teaspoonful will contain between 75 and 85 grains of the salt by triturating in a warm mortar 5 parts of sodium "nitrite" crystals and 13 parts of "acid citric crystals" until liquid, and then adding 85 parts of granular sodium phosphate and triturating and shaking until a solution results.

Evidently an error has crept into Mr. Tobin's statement; because, according to our experience, citric acid will actively decompose sodium nitrite with evolution of red fumes. Sodium nitrate was undoubtedly intended.—*The Editor.*]

OPIUM ASSAYING.

BY LYMAN F. KEBLER.

Numerous and exhaustive as have been the investigations on the analysis of opium, yet the morphiologist is constantly encountering new difficulties in the course of his work. The status of the present official method in a measure contributes to these difficulties, in that it does not require the analyst to apply a correction to the crude morphine obtained by the prescribed process. This, undoubtedly, has left an unguarded avenue for the clever adulterator, and the writer has reasons to believe that it has been taken advantage of. It is well known that the same process will not yield equally pure morphine with the various kinds of opium met with in an analytical laboratory. Under these existing conditions embarrassing circumstances may arise, one analyst applying a correction while another neglects to do so.

A year ago the writer read a paper before the New York Section of the Society of Chemical Industry,[1] in which the several methods

---

[1] 1895, *J. Soc. Chem. Ind.*, 14, 464; abstr. AM. JOUR. PHARM., 67, 398.

for applying a correction to the crude morphine were briefly treated. Preference was then given to the ash method, but titration with volumetric acid solutions was also strongly advocated.

Dr. Dott,[1] in reviewing the subject of applying a correction, gave as his opinion that an adulterated opium could be detected by dividing the crude morphine into three parts, and estimating the impurity in one part by the ash method, treating a second part with barium hydroxide, while the third part is to be titrated with a volumetric acid solution. Such a procedure, undoubtedly, would be sufficient to determine the amount of pure morphine in a sample of the crude material; but is it practicable?

During the past year the writer has dealt with opium that was entirely different from the opium assayed the year previous. It contained the normal percentage of morphine, was very moist, and consecutively numbered cases yielded vastly different appearing morphine. One case might yield a very satisfactory white morphine, another a yellowish-white product, a third a dark-brown, while a fourth would be an intimate mixture of distinctively light-colored and dark-colored crystals of morphine. The opium had a very good appearance and was called "Turkey opium." The following data will serve to give the reader an idea of the opium:

No.	Per Cent. of Moisture.	Per Cent. of Morphine on Moist Basis.	Per Cent. of Morphine on Dry Basis
1	23·50	11·30	14·76
2	19·11	9·98	12·39
3	21·20	11·75	14·18
4	19·33	9·60	11·89
5	24·94	9·59	12·77
6	22·18	12·37	15·89

Some analysts are of the opinion that an experienced operator is able to judge whether a given sample of crude morphine needs to have a correction applied or not. This was also the writer's opinion until he met with the present opium. Dr. Squibb has diligently compared the relative merits of the lime-water process and the absolute alcohol method, with the conclusion in favor of the former. Below are given the results of a comparison of the ash method,

[1] 1896, *J. Soc. Chem. Ind.*, 15, 91.

lime-water process, and titration with a volumetric acid solution, using hæmatoxylin as indicator. The samples operated on were taken at random during the past year, from about 155 assays, and the results are as follows:

No.	Per Cent. of Ash.	Per Cent. of Impurity by the Ash Method.	Per Cent. of Impurity by the Lime-Water Process.	Per Cent. of Impurity per Titration with Volumetric Sulphuric Acid.
1	3·04	7·60	8·42	5·75
2	2·18	5·45	8·00	6·50
3	0 00	0·00	0·00	4·00
4	2·24	5·60	6·60	4·74
5	2·98	7·45	5·48	4·50
6	2·32	5·80	5·53	4·25
7	2·16	5·40	4·00	4·25
8	1·67	4·19	4·20	5·74
9	2·04	5·12	1·24	3·74
10	3·45	8·62	1·40	5·17
11	2·75	6·87	5·72	5·06
12	3·06	7·65	4·72	3·51
13	2·00	5·00	1·32	4·74
14	1·08	2·70	4·52	3·59
15	1·86	4·65	10·42	—
16	1·95	4·87	8·22	—
17	2·91	7·27	8·00	3·59

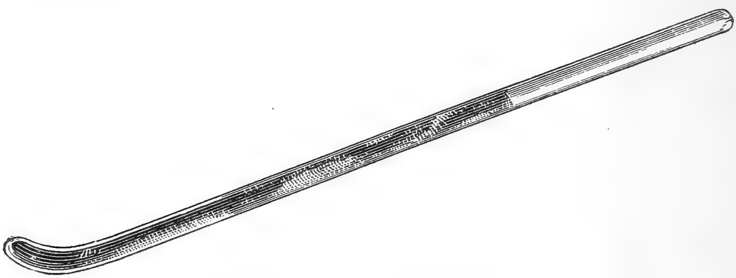
The above results indicate that the present methods of applying a correction are unsatisfactory. Nos. 1, 16 and 17 were the samples that were selected for morphine that would not need a correction, and yet they appear to contain the largest amount of impurity. No. 3 was a morphine that we obtained from denarcotized tincture of opium. Both the ash and the lime-water methods indicate it to be pure, while titration with acid indicates an impurity of at least 4 per cent. The sample contained considerable coloring matter, which was dissolved by the lime water, rendering it very dark. In a number of other cases the same results were obtained only in a less marked degree. It is not necessary to comment further on these results, since the careful observer can draw his own conclusions. The writer wishes only to call the reader's attention to the great difference between the ash and the lime-water methods in Nos. 9, 10 and 13. The presence of manganese was noted in the ash.

A THERMOMETRIC STIRRING ROD.

By Charles H. LaWall.

For some time past there has been in use, in the laboratory where the writer is engaged, a convenient form of stirring rod, which enables the worker to note the temperature of a liquid without the necessity of using a thermometer; or, to describe its functions more accurately, it is a tubular glass stirring rod, containing a compound of low melting point, which, by its fusion, indicates when the temperature of a liquid arrives at a certain point, above which it is not desired to have it proceed.

It is believed that a short description of the form and uses of this appliance would be welcomed by many to whom its use will soon become familiar, and, by calling the attention of others to a few of the advantages derived from its use, it may undergo improvements which will serve to widen its field of application and render it of greater value.



A Thermometric Stirring Rod.

The description of it is as follows: A common glass tube about 5·5 millimetres ($\frac{3}{16}$ inch) in diameter, outside measurement, and 18 centimetres (7 inches) long, is sealed by fusion in the flame of a Bunsen burner, and bent slightly as in the illustration. This is a convenient shape for a stirring rod, being especially adapted for removing the resinous deposits which sometimes adhere to the bottom of a capsule, as usually occurs in the assay of opium preparations.

Beeswax, paraffin or any other substance adapted to the requirements of the case, is then carefully adjusted to any desired melting point by the addition of a substance which raises or lowers the degree of temperature at which it melts. The tube is then filled about three-quarters full of the compound by rolling fragments be-

tween the fingers until they can be inserted into the open end of the tube, when a slight application of heat will melt the substance and cause it to run to the bottom.

The open end of the tube is then fused over a Bunsen burner until almost entirely closed, only a capillary orifice being allowed to remain, to permit the equalization of pressure. A subsequent verification as to its point of registration is accomplished by placing the rod in a beaker of cold water, accompanied by a thermometer, and gradually raising the temperature. The number of degrees indicated by the thermometer, at the moment when the compound assumes a liquid state, are noted as the point of registration.

The great range of its adaptability gives this rod a permanent place among the convenient forms of apparatus used for special purposes, for, by using the various kinds of paraffins and waxes, a range in temperature from 40° to 90° C. may be obtained.

In manufacturing the scaled iron salts, solid extracts and preparations of the same class, which require to be kept below a certain temperature during the process of evaporation it will be found of great benefit in the saving of time, as the operator can turn his attention to other duties, while, at the same time, he is easily enabled to note when the temperature reaches the point indicated by the rod, without being compelled to give it the close attention which the use of a thermometer requires in similar cases.

305 Cherry Street, Philadelphia.

CAMPHOR LEAF OIL.[1]

By David Hooper, F.C.S.

The recent high price of camphor, on account of the war between China and Japan, and trade monopolies, has caused some anxiety in countries where it is largely consumed; and China and Japan being at present the only two countries where camphor is produced on a large scale, it has been thought desirable that its cultivation should be taken up in other lands. In Japan the camphor trees grow at high elevations away from the sea, and only large trees of about 100 years old are selected for use in making the camphor. From the export returns of this country, it seems that the supply is gradually becoming exhausted. In the island of Formosa the camphor trees

[1] *Pharmaceutical Journal*, January 11, 1896.

are said to be by no means plentiful, and they grow only in certain favorable situations, as far as the climate is concerned, with savage tribes in the immediate vicinity. Here the trees are not considered worth taking until they are fifty years old, and the wood only of the roots and stems is subjected to distillation.

The camphor tree grows very well in India. The Calcutta Botanic Gardens possess a fine avenue of trees, which were introduced in 1802. It grows well in the Ootacamund Botanical Gardens and in other parts of the Nilgiris. It has been planted as an experimental measure, at Jhansi, in the Northwestern Provinces, and in other districts in the plains. Camphor has been known and used in India for many centuries. In A. D. 642, Indian princes sent camphor as a tribute or offering to the Chinese emperors. At one time the tree flourished in Nepal and Tipperah, a large tract of land lying between Bengal and the Upper Irrawaddy. Within the present century camphor was imported from Chittagong, but it has been said that the discovery by the hill-men of distilling it from the root led to the extinction of the trees.

In Ceylon the camphor tree grows well at elevations of 5,000 feet and less; it has the habit of a willow in the island, and it has been suggested that, like a willow, the trees should be coppiced, and the leaves and branches used for preparing the oil. The tree grows for ornamental purposes in Naples and other parts of Italy. Professor Maisch, in 1891, reported on the cultivation of camphor in Florida, where it flourished in almost any soil. The solid oil was made from the leaves and branches; the yield was 4 per cent., and the product was more like that of Japan, as it had an odor of safrol. California has lately become the scene of an industry which has for its objects the planting of the laurel camphor and the preparation of the oil for the American market. The tree has also become naturalized in Java, Brazil, Jamaica, and other isles of the West Indies, Mauritius and Madeira.

It is very evident that the camphor tree is able to grow very luxuriantly and extensively in the warmer, temperate and tropical parts of the world, far removed from China and Japan; but the slow growth of this tree would prevent all but large capitalists from opening up plantations and waiting for the plants to sufficiently mature. If it is true that in the island of Formosa the wood only of the larger trees is used, and the leaves and branches rejected, then there

can hardly be a scarcity of the trees, or the manufacture must be conducted in a very reckless and extravagant manner. The camphor from the Dryobalanops tree is said to be quite liquid if a young tree is tapped, and solid if the tree is old. Under such circumstances it would seem that the liquid oil constituted the first stage in the development of the solid substance. It is stated in some text-books on materia medica that the stearopten exists in every part of the plant, including the leaves. On the other hand, it is remarkable that the leaves are not used in China and Japan; perhaps the natives have found that the leaves only give a liquid product which cannot be profitably turned into camphor. As there is no definite information on this point to be found in any description of the industry, I thought it would be interesting to try the effect of distilling the leaves. Another reason that encouraged me to make some experiments in this direction, was the hearty manner in which some energetic planters of Ceylon have taken up the camphor question.

A large number of experiments have been made, and a great deal has been written with regard to camphor oil, the by-product obtained in refining crude camphor before it is formed into blocks. This has been proved to be a very variable liquid, with a specific gravity ranging from 0·88 to 1·00, an erratic optical rotation, although usually to the right, and containing camphor in suspension, or in solution, or none at all.

The first sample of leaves came from an umbrageous tree growing in the Government Gardens at Ootacamund. Fifty pounds of the leaves in a fresh state were distilled in a large copper still with sufficient water for six hours. Eight fluid ounces of oil were separated from the distillate, giving the yield of essential oil 1 per cent. The oil had a slightly yellow color, a specific gravity at 15° C. of 0·9322, and a rotation of + 9°·4 in a 2-decimetre tube. It gave off a small quantity of liquid at 160°, and began to boil regularly at 175°.

Collected below 180°	20·6
" " 185°	31·0
" " 190°	15·5
" " 195°	10·6
" " 200°	5·6
" " 205°	3·3
Residue	8·6
	95·2

The loss here was occasioned by some of the camphor congealing in the condenser; the amount, however, in this sample could only be about 10 or 15 per cent. The residue in the retort was quite solid in the cold, and had a yellowish color and strong camphoraceous odor.

The second sample was obtained from some younger trees grown at Naduvatam, on the Nilgiris, a district more than 1,000 feet lower than Ootacamund. The leaves were distilled in the same manner as in the previous experiment, but a large quantity of camphor condensed during the process and almost choked up the worm of the still. About 4 ounces of liquid were collected, having a mass of crystalline matter suspended in it. The oil was strained through cloth, and the solid matter, pressed hard to remove all the liquid portion, was left as a cake of camphor, weighing 2 ounces. The clear oil had a specific gravity of 0·9314 at 15° C., and twisted a ray of polarized light + 54° in a 2-decimetre tube. It began to boil regularly at 165°.

Collected below 185°	13·3
" " 190°	20·0
" " 195°	15·5
" " 200°	20·0
Residue	25·0
	93·8

The loss was again accounted for by some of the camphor condensing in the cool tube. About one-half of this oil consisted of solid camphor, or, calculating the camphor already separated, the oil from the Naduvatam leaves contained 75 per cent., which is a very satisfactory result. The camphor, dissolved in rectified spirit, twisted a ray of light + 30°. The altitude of the Government Gardens in Ootacamund is 7,300 feet, and it is possible that this elevation influences the formation of the solid stearopten in the leaves. At any rate, it is interesting to know that a large proportion of camphor can be obtained from the oil of the leaves themselves, and, probably, if taken from trees grown at a much lower elevation, a much larger proportion of this useful substance could be collected.

DRINK PLANTS OF THE NORTH AMERICAN INDIANS.[1]

BY V. HAVARD.

These plants may be considered under three heads:

(1) Those yielding alcoholic liquors.

(2) Those yielding stimulating, exhilarating or intoxicating principles other than alcohol.

(3) Those furnishing juices, or, by infusion, pleasant beverages more or less used to quench thirst. The writer contends that the American Indians north of Mexico had not acquired the knowledge of preparing alcoholic drinks at the time of the landing of Columbus. In Mexico, from time immemorial, the abundant sap of the Maguey (Agave Americana) was fermented to form the national drink, pulque. While acquainted with fermentation, distillation was unknown to the Aztecs, this being an art introduced from Europe; hence, the Mexican liquor mescal, manufactured by distillation from baked, pounded and fermented heads of several species of agave is a product of a much later period. The Indians of Arizona and New Mexico knew how to prepare "mescal beer" from the heads of Agave Parryi and A. Palmeri.

From maize, both the Mexicans and the Peruvians produced a vinous liquor called chica. The cultivation of maize spread rapidly northward, and before the days of Columbus it was the principal crop of all the agricultural Indians, and it seems almost incomprehensible that the primitive and very simple art of making corn beer should never have found its way north of the Rio Grande.

For several generations, the Apaches of Arizona and New Mexico have prepared, from corn, an alcoholic drink which they called tizwin or tulpi. They probably obtained this knowledge from the Mexicans or Mexican Indians toward the end of the last or beginning of this century.

From the fruit of the Giant Cactus (Cereus giganteus, Engelm.) the Indians and Mexicans prepare a fermented liquor having the taste and smell of sour beer, although somewhat stronger. The larger and sweeter fruit of Cereus Thurberi, Engelm., of Sonora and Lower California, is used for the same purpose. According to Col. Cremony, "it is upon this liquor that the Pimos, Maricopas and

[1] Abstracted from the Bulletin of the Torrey Botanical Club, February, 1896, by George M. Beringer.

Yumas get drunk once a year, the revelry continuing for a week or two at a time, one-third of the party only indulging at a time, the remainder being required to take care of their stimulated comrades and protect them from injuring each other or being injured by other tribes."

The fruit of Opuntia Tuna, Mill., and O. Ficus-Indica, Haw., are used by Mexican Indians to make an intoxicating drink, called colonche, having a pink color and the taste of hard cider.

The fleshy fruit of several species of yucca are converted by the Chihuahua Indians into a fermented beverage, which is sometimes distilled by the Mexicans into indifferent aguardiente. The fruit of the Mezquite (Prosopis juliflora, DeC.) contains more than half its weight of nutritive principles, especially sugar in the proportion of 25 to 30 per cent. When cooked, pounded, mixed in water and strained, it yields a very nutritive and pleasant beverage called "atole;" this readily undergoes fermentation, whereby a kind of beer is produced, formerly much used by the Colorado and Gila River Indians. Plants yielding stimulating, exhilarating or intoxicating principles not intoxicating: the Anhalonium Engelmannii, Lem., a napiform, tuberculous cactus, 2 to 3 inches long, and hardly rising above ground, is called Peyote. Mexicans cut it into slices, which are kept dry for medicinal purposes, being commonly used in fevers. It is principally as an intoxicant, however, that it has become noted along the Mexican border, being eaten raw or added to native tizwin to make it stronger. It is said that the Indians or Mexicans partaking of this adulterated tizwin become temporarily crazy and uncontrollable. Closely allied to this is the Lophophora Williamsii, var. Lewinii, Coult. The "tops," under the name of Mescal Buttons, have been the subject of investigations. Lewin and Heffter found in them several alkaloids and at least two resinous substances, the latter being the active principles. An alcoholic extract, according to Lewin, produces in animals symptoms almost identical with those caused by strychnine, being, in small doses, a cardiac and respiratory stimulant. Drs. Prentiss and Morgan, of Washington, found that the chief physiological effect was the production of beautiful colored visions in an ever-changing and brilliant picture, being attended with wonder and admiration, but no merriment, delirium or intoxication. The Kiowa Indians were formerly much addicted to the use of this plant in their religious ceremonies. Each Indian chews

and swallows ten or twelve buttons at intervals between sundown and morning, and then sits quietly for a day or two enjoying the pleasurable effects of the drug.

The leaves and seed of Datura meteloides and the Mexican D. quercifolia are credited with deliriant properties. According to Bellanger the Indians near San Antonio formerly used the seed of Sophora secundiflora, Lag., as an intoxicant, half a bean producing "delirious exhilaration, followed by a sleep which lasts two or three days."

The most interesting plant of this class is doubtless Ilex Vomitoria, Ait., the Cassine or Yuoen of our Southern Indians. This was used by them long before the advent of the white man. It is likely enough that the Indians had several methods of preparing it; for purposes of conviviality making a weak decoction, but at religious festivals making it very strong and adding other ingredients, such as Button Snake root (Eryngium aquaticum) and Iris versicolor or Lobelia inflata, with the effect of imparting strong emetic properties, and they continued drinking and ejecting for one or two days, until they had sufficiently cleansed themselves.

Among the plants furnishing wholesome and palatable juices, the first place belongs to the maples. The Indians knew the value of the sap, they drank it and made sugar from it before the advent of the whites.

Box Elder (Acer Negundo, L.), our White Walnut (Juglans cinerea, L.), and most species of Birch (Betula), yield saccharine saps. In our Western deserts where water is scarce, Nature provides pulpy, juicy plants, from which Indians can quench their thirst. Chief among these are several species of Cactus. The succulent leaves and stem of such plants as Agave, Dasylirion Texanum and Yucca are similarly useful. The long, creeping stems of the Sand-Food (Ammobroma Sonoræ, Torr.,) are a palatable food and also a water substitute.

The mucilaginous seed of Salvia polystachya, Ort., known as Chia in Mexico, are roasted, powdered and thrown into water, and when sweetened and flavored, yield a very agreeable, wholesome and demulcent beverage.

The acidulous fruits of a number of species of Rhus were used to make the water more cooling and refreshing. In California the Manzanitas are used for the same purpose. The fruit of Shepherdia

argentea, Nutt., and S. Canadensis serve a similar use, and likewise the fruits of the Barberries.

For aromatic teas, Sassafras has always been appreciated. It is quite probable that the virtues of New Jersey tea (Ceanothus Americanus, L.), used extensively during the war for independence, had been indicated by the natives. Fragrant teas were also prepared from Spice-Bush (Lindera Benzoin, Blume) from wintergreen (Gaultheria procumbens), and sweet fern (Myrica asplenifolia), sweet golden rod (Solidago odora). Less acceptable must have been the infusions of Marsh Tea (Ledum palustre, L.) and Labrador Tea (L. Groenlandicum, Oeder).

Under the name of Encenilla or Chaparral Tea, the flowering tops of Croton corymbulosus, Engelm., is much used in Western Texas by Mexicans and Indians, as well as by our colored U. S. soldiers, who prefer it to coffee. It appears to be devoid of theine or other stimulating principle, except volatile oil. Other plants similarly used in the same country and Northern Mexico are: Bidens Bigelovii, Gray, Salvia ballotæflora, Benth., Hedeoma Drummondii, Benth., and Actinella odorata, Gray.

SOLANUM CAROLINENSE IN EPILEPSY.

The conclusions of Dr. Charles S. Potts on *Solanum Carolinense* in the treatment of epilepsy have been summarized in the *Therapeutic Gazette*, December 16, 1895, as follows:

(1) The drug has a decided influence for good upon the epileptic paroxysm.

(2) This influence is probably not so great or so sure as that obtained by the use of antipyrin and the bromides.

(3) In those cases in which it is of service, it relieves the paroxysms without causing other unpleasant symptoms, such as are sometimes caused by the use of large doses of the bromides.

(4) The dose ordinarily recommended (10 to 15 drops of the fluid extract) is too small; as much as a teaspoonful or more, four times a day, is often needed to secure results.

EDITORIAL.

THE SEVENTY-FIFTH ANNIVERSARY OF THE PHILADELPHIA COLLEGE OF PHARMACY.

The Philadelphia College of Pharmacy has passed her seventy-fifth milestone, and with renewed vigor is growing and advancing in the cause of pharmaceutical education.

The details of the entertainment by which this event was celebrated will be found on another page. It may be worth while, however, to note here some of the facts which were developed in the numerous able addresses by men representing widely different interests.

First, it was conclusively shown that this College is well and favorably known wherever pharmacy exists, but apparently least of all in the city of Philadelphia, the Mayor confessing to having only recently learned of the existence of this institution, although for a number of years he lived in its immediate vicinity.

The second subject upon which special stress was laid by several speakers was the magnitude of responsibility under which the pharmacist constantly labors. The slightest variation from the exactions of his profession, or the failure to discover and rectify the blunder of a physician, is sufficient to call down upon him the severest condemnation of the public without the formality of a hearing.

Finally, it was conceded on all sides that the Philadelphia College of Pharmacy has steadily risen from a small beginning, until now she stands among the foremost institutions of the world, and this without aid from the State or City in which she has been reared.

THE METRIC SYSTEM IN THE UNITED STATES.

In the March number of this JOURNAL we printed the Hurley Bill, designed to require the use of the metric system of weights and measures in this country. Since then, House Bill, No. 7,251, introduced by the Hon. C. W. Stone, has been substituted for the original bill.

The differences between the two are slight, but we print now the revised bill as follows :

A Bill to fix the standard of weights and measures by the adoption of the metric system of weights and measures.

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That from and after the first day of July, eighteen hundred and ninety-eight, all the Departments of the Government of the United States, in transaction of all business requiring the use of weight and measurement, except in completing the survey of the public lands, shall employ and use only the weights and measures of the metric system.

"SEC. 2. That from and after the first day of January, nineteen hundred and one, the metric system of weights and measures shall be the only legal system of weights and measures recognized in the United States.

"SEC. 3. That the metric system of weights and measures herein referred to is that in which the ultimate standard of mass or weight is the international kilogram of the International Bureau of Weights and Measures, established in accordance with the convention of May twentieth, eighteen hundred and seventy-five, and the ultimate standard of length is the international metre of the same bureau, the national prototypes of which are kilogram numbered twenty and metre numbered twenty-seven, preserved in the archives of the office of standard weights and measures.

"SEC. 4. That the tables in the schedules annexed to the bill authorizing the use of the

metric system of weights and measures, passed July twenty-eighth, eighteen hundred and sixty-six, shall be the tables of equivalents which may be lawfully used for computing, determining, and expressing the customary weights and measures in the weights and measures of the metric system."

This revised bill passed the House of Representatives by a vote of 119 to 117. By one of those mysterious influences which frequently prevail in legislative bodies, a motion to reconsider was made and carried. It was then referred back to the Committee on Coinage, Weights and Measures, so that now it is just where it was two months ago.

The exertions of those in favor of a rational system of weights and measures will now need to be redoubled, and everyone should write to his Representative at Washington requesting him to vote for H. R., No. 7,251. The Special Committee on Weights and Measures of the American Pharmaceutical Association, of which Professor Frank G. Ryan is chairman, is taking active steps to have all the State Pharmaceutical Associations adopt resolutions favoring the passage of this bill. It is evident that some pharmacists are opposed to the bill simply because they are ignorant of what the results of favorable action would be. They appear to think that every weight and measure would have to be calculated into the metric system, not realizing that it is as easy to use a set of metric weights as any other, and that not nearly so many conversions of weights by calculation would be necessary as now.

It is only a question of time when the whole world will use the metric system. Will the United States be the last to fall into line?

PENNSYLVANIA PHARMACEUTICAL ASSOCIATION.

The following notice will interest many pharmacists of this State:

The Pennsylvania Pharmaceutical Association will hold its nineteenth annual meeting at the Holly Inn, Mt. Holly Springs, Cumberland County, on the 16th, 17th and 18th of June next. The change has been made from the Gettysburg Springs Hotel, which will not be opened this season.

J. A. MILLER, *Secretary.*

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

THE NATIONAL FORMULARY OF UNOFFICIAL PREPARATIONS. Revised edition. By authority of the American Pharmaceutical Association, 1896.

Next to the Pharmacopœia, the National Formulary holds the most important place among the every-day books of the pharmacist. The present edition bids fair to maintain this position, for, under the chairmanship of Professor Diehl, the Committee have produced a book which well deserves the attention it will get from every practical pharmacist in the land.

No doubt there are many unofficial formulas in existence which are not found in its pages, but the members of the Committee have done the best they could, and they are deserving of great praise. Their reasons for declining to recognize the demands for some formulas are set forth in the preface, as follows:

> The demand for additional formulas has been carefully considered by the Committee. This demand, unfortunately, was in most cases for working formulas for preparations which have come into current use under fanciful trade names, and for which no formulas, other than obscure indications of composition borne on the labels, are known to pharmacy. The Committee did not consider it within the scope of their duties to devise and construct formulas for

such preparations, the more particularly since their composition is only imperfectly given, and because the demand for them seems to be dependent upon the skill and industry with which they are brought to the attention of the medical profession, rather than upon any intrinsic superiority that they possess over the medicinal agents.

The change to the metric system is a step in the right direction.

Every pharmacist should have this book and use it; at the same time he will confer a lasting benefit on the public, and advance his own interests if he will persuade physicians to prescribe its preparations, and thereby remove the necessity for the use of the fanciful trade-marked and otherwise protected preparations which the Formulary Committee have seen fit to so severely score in the language just quoted.

DIE OBLITO-SCHIZOGENEN SECRETBEHÄLTER DER MYRTACEEN. Von Gotthilf Lutz, Apotheker. An inaugural dissertation presented to the Faculty of the University of Bern, for the degree of Doctor of Philosophy.

UNTERSUCHUNGEN ÜBER DIE SEKRETE. Mitgeteilt von A. Tschirch.

15 UEBER DAS AMMONIACUM. Von H. Luz. Reprinted from *Archiv der Pharmacie*, 233, 7 und 8 Heft, 1895. An interesting and valuable contribution to the chemistry and botany of this gum resin.

16 BEITRÄGE ZUR MIKROSKOPISCHEN KENNTNISS DES OPIUMS. Von Dr. Mjöen. Reprinted from *Archiv der Pharmacie*, 233, 7 Heft, 1895.

UEBER BAU UND NERVATUR DER BLATTZÄHNE UND BLATTSPITZEN MIT RÜCKSICHT AUF DIAGNOSTISCHE ZWECKE IM GEBIETE DER PHARMAKOGNOSIE. Von Hans Virchow. Reprinted from *Archiv der Pharmacie*, 234, Heft, 2 1896.

UNTERSUCHUNG ÜBER DIE BLATTFARBSTOFFE UND DIE BEZIEHUNGEN DES CHLOROPHYLLS ZUM BLUTFARBSTOFF. Von A. Tschirch. *Résumé* from *Schweiz. Wochenschrift für Chemie und Pharmacie*, 1896, No. 10.

WAS IST EIGENTLICH PHARMACOGNOSIE? Von A. Tschirch. Reprint from *Zeit. des Allgem. österr. Apotheker-Vereines*, 1896, No. 3.

NOTIZ ÜBER DIE WURZEL VON RUMEX NEPALENSIS. Von O. Hesse. Reprint from *Berichte der deut. chem. Gesellschaft*.

ZUR GESCHICHTE DES PROTEACINS. Von O. Hesse. Reprint from Liebig's *Annalen der Chemie*. 290 Band, 1896.

ZUR PRÜFUNG DES CHININSULFATS. Von O. Hesse. Reprint from *Archiv der Pharmacie*, 234, Heft 3, 1896.

THE PURPOSES OF ETHNO-BOTANY. By J. W. Harshberger. A lecture delivered before the University Archæological Association, December 4, 1895, and reprinted from *Botanical Gazette*, 21, 146.

ANNUAL REPORT ON THE YEAR 1895. E. Merck, Darmstadt. Published in March, 1896.

The 137 pages of this report are full of interesting matter, as usual. The first twenty-eight pages are devoted to original communications, and the balance to preparations.

FOREST FIRE LEGISLATION IN THE UNITED STATES. Circular No. 13, U. S. Department of Agriculture, Division of Forestry. B. E. Fernow, Chief.

FACTS AND FIGURES REGARDING OUR FOREST RESOURCES BRIEFLY STATED. U. S. Department of Agriculture, Division of Forestry. B. E. Fernow, Chief.

SEVENTEENTH SEMI-ANNUAL DIVIDEND MEETING OF THE EMPLOYEES OF THE PROCTER & GAMBLE COMPANY, IVORYDALE, O., containing an address on "The Relation of Capital and Labor," by Washington Gladden, D.D., and one on "Higher Citizenship," by Hon. Benjamin Butterworth.

UEBER REINDARSTELLUNG DER GÄHRUNGSMILCHSÄURE, mit Einleitenden Versuchen über Destillationen in Vakuum der Quecksilberluftpumpe. Dissertation von Wilhelm A. Dïjes, Dr. Phil. Hildesheim, 1895. Pp. 44.

HOW TO MAKE TABLETS. By Frank Edel. Spatula Publishing Company, 8 Oliver Street, Boston, Mass.

THE JACK RABBITS OF THE UNITED STATES. By T. S. Palmer, M.D., Assistant Chief of Division of Ornithology and Mammalogy, U. S. Department of Agriculture. 1896.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, April 21, 1896.

The seventh regular Pharmaceutical Meeting was held in the Chemical Lecture Room of the College at 3 o'clock.

Mr. F. W. E. Stedem was chosen chairman, and the reading of the minutes of the previous meeting was dispensed with.

The first paper, on "Opium Assaying," was read by Mr. Chas. H. LaWall, in the absence of the author, Mr. Lyman F. Kebler. (See page 257.) After numerous experiments, Mr. Kebler is convinced of the necessity of making corrections for the impurities in the crude morphine obtained by assay, and for this purpose he employed the ash, titration and lime-water processes, obtaining results which would hardly warrant a comparison of these methods.

Mr. J. Henry Schroeder, of Cincinnati, O., contributed a paper entitled "A Menstruum for the Extraction of Kola," which was read by Professor Trimble. (See page 254.) At a recent Pharmaceutical Meeting, samples of fresh kola nuts were presented by Mr. Fred. B. Kilmer (AM. JOUR. PHARM., 1896, p. 118), and in response to inquiries from druggists for a menstruum for this drug, Prof. F. G. Ryan made several extractions of these samples in their fresh state. These were assayed by Mr. Schroeder, and in comparing his results, diluted alcohol acidified with acetic acid was shown to be the best solvent for the extraction of the alkaloids. Samples of the extracts made by Professor Ryan accompanied the paper.

Professor Trimble stated that the yield of alkaloid after treatment of one of the samples with acid, to effect hydrolysis of the glucoside, was no greater than that yielded previous to this operation.

The next paper was on "Solution of Citro-Phosphate of Sodium," by Mr. W. C. Wescott. (See page 256.) This preparation is similar to the commercial article known as "melachol," and answers the demand by physicians for a solution of sodium phosphate containing 60 grains of the salt in 1 fluid drachm. Accompanying the paper were samples of solutions containing the constituents in varying proportions, so as to liquefy; but the one which seems to be

most satisfactory in taste and general appearance has the following formula: Sodium nitrate, 2 grammes; citric acid, 13 grammes; sodium phosphate, 100 grammes; and sufficient water to measure 100 cubic centimetres.

Professor Trimble called attention to a serious error in a formula published recently in one of the drug journals, where *nitrite* of sodium was directed. This, when brought into contact with the other constituents, is decomposed with evolution of red fumes.

Mr. Chas. H. LaWall presented the last paper, which was entitled "A Thermometric Stirring Rod." (See page 260). This instrument serves the double purpose of stirring rod and thermometer, and where it can be utilized has the advantage over the latter in requiring less careful watching. It consists simply of a piece of glass tubing closed at one end by fusion and partly filled with a mixture of paraffin, wax and other substances, in proportions varying so that the melting point of the contents of the rod will indicate the temperature. These rods can be made so that they will individually indicate temperatures ranging from 40° C. to 90° C. Samples of them were exhibited.

On motion, the meeting adjourned. THOS. S. WIEGAND, *Registrar.*

EXAMINATION QUESTIONS OF THE PHILADELPHIA COLLEGE OF PHARMACY, 1895-6.

FIRST YEAR EXAMINATION.

PHARMACY.

A—Percolation. (1) Define its principle of action. (2) What are the advantages of previous maceration? (3) How may the exhaustion of the drug be determined? (4) How may the alcohol remaining in an exhausted drug be economically recovered? (5) Name two methods of regulating the flow of the percolate. (6) What is repercolation? Describe its advantages.

B—Solvents and Menstrua. (1) What solvent is most frequently used in pharmacy? (2) Name five solvents in the order of their importance, stating the class of substances for which each solvent is adapted. (3) In what respects does a solution differ from a percolate? (4) Define simple solution, compound solution, chemical solution, menstruum, diluent, macerate, marc.

CHEMISTRY.

C—(1) Give the formula of a haloid acid, and of an oxygen acid, and explain the difference between them. (2) What is meant by the basicity of an acid? Illustrate by examples. (3) Explain the difference between a neutral and an acid salt, and illustrate by examples.

D—(1) Write the reactions for the production of hydrogen sulphide, and the production of nitric acid. (2) Complete the reactions:

$$MnO_2 + 4HCl =$$

$$Na_2S_2O_3 + H_2SO_4 =$$

$$Ca_3(PO_4)_2 + 2H_2SO_4 =.$$

BOTANY.

E—Structure. (1) What are the two most important uses of the root? (2) Name three other ways in which some roots may be useful to the plant. (3)

State how a thalloid shoot differs from an ordinary shoot. (4) As respects their position or insertion, into what different kinds may buds be divided? (5) Draw a leaf which answers the following description: Petiolate, stipulate, simple, spatulate, base, acute, apex emarginate, margin entire. (6) On what numerical plans, respectively, are most monocotyls and dicotyls constructed? (7) Define briefly each of the following kinds of pistils: gymnospermous, angiospermous, syncarpous and apocarpous.

F—Classification. (8) Name the four primary divisions of the plant sub-kingdom, and give examples of common plant species that illustrate each. (9) In which of these divisions is the gametophyte the more prominent form? (10) In which of these divisions do we find plants producing both microspores and macrospores? (11) Name two of the most important distinctions between gymnosperms and angiosperms. (12) In a seed, what part or parts represent the sporophyte, and what part or parts the gametophyte?

COMMITTEE.

G—Iodine. (1) Describe its physical appearance. (2) Give the principal commercial sources of Iodine. (3) Give a brief description of one method of manufacturing Iodine. (4) What is the specific gravity of Iodine? (5) Give a test for the presence of Iodine in a solution. (6) Give an antidote for poisoning by Iodine.

H—Heat. (1) What is the effect of heat upon solids? (2) What is its effect upon liquids? (3) Name the instrument usually employed for measuring degrees of heat. (4) What three scales are in common use? (5) Which of these scales are recognized by the United States Pharmacopœia? (6) How many degrees are included between the freezing and boiling points of water in each scale? (7) How can the degrees of one of these scales be converted into those of another? Give an example. (8) Why does a Bunsen burner give a blue flame?

I—(1) Which is best for cleaning a greasy bottle, an acid or an alkali? And why? (2) How would you determine the correctness of an ounce graduated measure? (3) How could you clean a bottle stained with tincture of chloride of iron? (4) What implement is used at the prescription counter for the process of trituration? (5) Draw a section of the shape best adapted to this use.

K—(1) How many c.c. of water would be displaced by a block of stone, 2 metres long, 2 centimetres wide, and 280 millimetres thick, if completely immersed? (2) How many grammes of official alcohol, sp. gr. ·820, would the same stone displace?

SENIOR EXAMINATION.

THEORY AND PRACTICE OF PHARMACY.

Put down on this paper all of the figures used in making your calculations.

A—(1) How many grammes are there in a pint of each of the following official liquids? *a.* Glycerin. *b.* Alcohol. *c.* Water. *d.* Acetic Acid. *e.* Chloroform. (2) If a body weighs 100 grammes when immersed in official glycerin, how much will it weigh if immersed in each of the following official liquids? *a.* Diluted Alcohol. *b.* Alcohol. *c.* Water. *d.* Acetic Acid. *e.* Chloroform.

B—Give the Synonym or Common Name; Unabbreviated Official or Latin Name; Ingredients in Preparing; Brief Outline of Process; Describe the

Appearance of—Burnt Alum, Plaster of Paris, White Precipitate, Diachylon Plaster, Blaud's Pills, Liver of Sulphur, Blistering Collodion and Volatile Liniment.

C—Give the Official Name; English Name; Ingredients; Brief Outline of Process; Describe the Appearance of—Infusum Digitalis, Extractum Calumbæ Fluidum, Oleum Terebinthinæ Rectificatum, Syrupus Krameriæ, Spiritus Myrciæ, Mistura Rhei et Sodæ, Extractum Colocynthidis Compositum and Resina Jalapæ.

D—(1) What is Ethyl Nitrite? (2) How is it prepared? (3) What are its uses? (4) How is it preserved from change? (5) What is Amyl Nitrite? (6) How is it prepared? (7) What are its uses? (8) How is it administered? (9) How is it preserved from change?

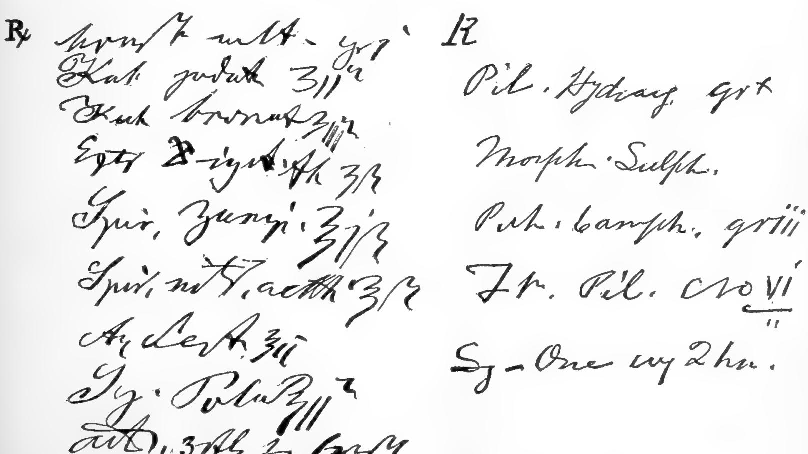
E—(1) How is Ether prepared? (2) What is its specific gravity? (3) What are its uses? (4) Name the usual impurities. (5) How may they be detected? (6) Is the vapor of Ether heavier or lighter than air? (7) What precautions are necessary in handling Ether?

F—Name five color tests for active principles which yield a red color with sulphuric acid or nitric acid. State what differences are noticed in the appearance of each liquid resulting from an application of each test.

G—Explain three methods of writing Metric prescriptions; illustrate each by an example, showing whatever advantages or disadvantages there may be in either.

H—(1) How is Wafer-paper prepared? (2) What are its properties? (3) What is the most convenient method for using Wafer-paper in flat discs in administering medicines? (4) State minutely how bitter or nauseous powders are enveloped by the use of Wafer-paper (not in flat discs). (5) Illustrate the above, if you choose, by drawing sketches.

I—Criticise and translate the following prescriptions. Write out the English names of each ingredient, with quantities. State how you would compound each; and if any incompatibility would be developed in either, state what it is, and what would be the proper procedure.



K—Criticise and translate the following prescriptions. Write out with English names the ingredients and quantities. State whether you would compound them as written, or what course you would pursue upon receiving them.

℞ Bismuthi Subnit ʒi
Sodii Bicarb gr XXX
Mft pil No XX
S. Take One After
Each meal
83291 3.16.1883 E.

℞ Quin. bisulph ʒss
Ext Eucalypt Fl ℥i
Aqua ℥ij
Sig- a teaspoonful

CHEMISTRY.

A—(1) What is the percentage composition of *Aqua Ammoniæ*, of *Aqua Ammoniæ Fortior*, and of *Spiritus Ammoniæ?* (2) Describe the preparation of these substances. (3) Give the chemical formulas for *Ammonii Chloridum*, *Ammonii Iodidum*, and *Ammonii Carbonas*. (4) What are the commercial sources of Ammonia and its salts?

B—(1) Give the formula, appearance and properties of *Calcii Chloridum*. (2) Give the formula, appearance and properties of *Calx Chlorata*. (3) How is this latter substance made, and what are its pharmaceutical and technical uses? (4) What is the common name of *Calcii Sulphas Exsiccatus*, and what is the material (common name) from which it is prepared?

C—(1) Describe the metal Aluminum and state its uses. (2) Mention the sources and methods by which it is obtained at present. (3) Give the formulas of *Aluminii Hydras* and of *Alumen*, and describe each of these.

D—(1) What is the chief ore of Mercury, and what is the same substance called when made artificially? (2) Give the formulas and names (common and official) of the several oxides of Mercury. (3) What is the composition of "Turpeth Mineral?" (4) Give the correct chemical name and formula of *Hydrargyrum Ammoniatum*.

E—(1) Describe the several oxides of Lead, and give their formulas and common names. (2) Mention the practical uses of each of these. (3) What is the composition of "White Lead," what of "Red Lead," and what of "Sugar of Lead?" (4) Give a distinctive test for each of these. (5) What is Goulard's Solution, and how is it made?

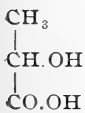
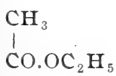
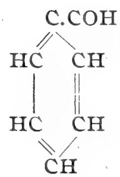
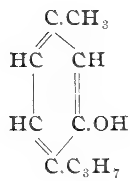
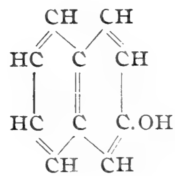
F—(1) What is the chemical name and formula of Chloroform? (2) Write the reaction for its production by the usual manufacturing process. (3) By what physical and chemical tests would you identify Chloroform? (4) What are the pharmacopœial tests for its purity? (5) What are the uses of Chloroform in medicine and pharmacy?

G—(1) What is an Aldehyde, and how does it differ from a Ketone? (2) Give an example of each class. (3) What reactions are common to both classes of compounds? (4) By what difference in reactions can they be distinguished?

H—(1) To what classes of carbohydrates do Glucose, Cane-Sugar, Invert-Sugar, Milk-Sugar, Dextrin and Maltose respectively belong? (2) State the reactions most characteristic of each of these. (3) How many of these are directly fermentable with yeast, and how many only indirectly? (4) If the latter, write the reactions whereby they become fermentable.

I—(1) Describe *Acidum Benzoicum*, and state by what physical and chemical tests it can be identified. (2) Write the reaction for its artificial production. (3) Describe *Acidum Salicylicum*, and state by what physical and chemical tests it can be recognized. (4) Write the reaction for its artificial production. (5) Show by graphic formulas the relation of these two acids to each other.

K—Write the full chemical name and the official designation for the following compounds:

MATERIA MEDICA AND BOTANY.

I—Botany. (1) State the distinction between an energid and a cell. (2) Define a cœnocyte. (3) Define a syncyte. (4) State a means by which cellulose may be distinguished from related substances. (5) How would you distinguish a leucoplast from an inulin grain? (6) Define the terms amyloplasts and chloroplasts. (7) What are enzymes? Name two examples of enzymes which occur in plants. (8) Name three vegetable carbohydrates. (9) How does a false tissue differ from a true tissue? (10) Name three tissues which are parenchymatous, and three which are prosenchymatous. (11) Name a tissue which is syncytic and another which is cœnocytic. (12) How does a schizogenous intercellular space differ from a lysigenous one? (13) In what groups of plants respectively should we look for monostelic, polystelic and schizostelic stems? (14) In what organ or organs of the higher plant should we expect to find separate phloem and xylem bundles? (15) In the stems of what plants should we expect to find closed collateral bundles?

II—Materia Medica. (16) Which of the following groups of plants furnish official root-drugs: Algæ, Fungi, Lichenes, Mosses, Ferns, Gymnosperms, Dicotyls and Monocotyls? (17) Write the names of two official root-drugs used in medicine chiefly as alteratives. (18) Write the names of two glucosidal root-drugs which are official. (19) Write the names of two official root-drugs which abound in secretion reservoirs containing resin. (20) Write the name of one official root-drug that contains bast-fibres, and of one that contains none. (21) Write the names of two official root-drugs that are narcotic poisons. (22) Write the official names of two rhizome drugs whose bundles are closed and scattered. (23) Write the official name of a rhizome drug whose bundles are chiefly arranged in a circle and are each enclosed in an endodermis. (24) Write the official names of two rhizome drugs that are powerful hepatic stimu-

lants. (25) Write the official names of two rhizome drugs derived from the Liliaceæ. (26) Write the names of the most important medicinal constituent of each of the following drugs: Ipecac, Hydrastis, Geranium. (27) Name two official bark drugs which are destitute of bast fibres. (28) Name an emetic drug which produces emesis by acting on the vomiting centre in the medulla. (29) Name an emetic which produces its effects by direct action upon the stomach. (30) Name an alkaloidal drug which is powerfully sialogogue and sudorific, and at the same time depresses the heart's action. (31) Name two official drugs, one of which, in moderate dose, tones the heart and slows its beats, and the other of which depresses it and slows its beats. (32) Define a cholagogue drug and name one. (33) Name two official drugs which are both narcotic and mydriatic. (34) In case of poisoning by tobacco, what antidote would be suitable after evacuating the stomach? (35) Why is atropine so frequently administered in cases of opium poisoning? (36) Name two drugs each of which stimulates the muscular coats of the smaller arteries, reducing their calibre. (37) Name a powerful alkaloidal drug which is anti-sudorific in its action. (38) How would you distinguish Logwood from Red Saunders? (39) By means of what structural difference would you distinguish Dandelion root from Chicory root? (40) What parts of the following plants are official: Datura Stramonium, Quercus Lusitanica, Humulus Lupulus, Canadian Hemp, and Anamirta Paniculata?

COMMITTEE.

A—Show all figures used in obtaining your answers to these questions. (1) An apothecary has two lots of Powdered Opium of the respective morphine strengths of 12 per cent. and 16 per cent. How much of each must he take to make 4500 c.c. of official Tincture of Opium if he desires to use Powdered Opium of the average morphine strength of the Pharmacopœia? (2) How many c.c. of Camphorated Tincture of Opium would an equal weight of Powdered Opium make? (3) About how much official Extract of Opium could be made from the same weight of Powdered Opium? (4) How many milligrammes of water would weigh exactly as much as a litre of Official Alcohol, temperature not considered?

B—Acetic Acid. (1) Give its chemical formula. (2) How is the commercial product manufactured? (3) How may it be made from Ethyl Alcohol? (4) Name the official Acetic Acids and give the percentage of Absolute Acid in each. (5) How would you prove the presence of Acetic Acid in an aqueous solution of an Acetate of an inorganic base? (6) Define the class of preparations called Vinegars. (7) Give the unabbreviated Latin titles of the official Vinegars. (8) Give the ingredients in each. (9) Give an official process for Spirit of Mindererus. (10) What do you regard as the maximum dose of the Morphine Salt of Acetic Acid?

C—(1) Write the official names of three important drugs of North American origin, and name an important medicinal constitueut of each. (2) Name an official bitter-tonic drug that is destitute of tannic matters, and whose fluid preparations, therefore, do not form a precipitate with ferric solutions. (3) Name two official barks distinguished from all others by being colored a deep red by a solution of one of the caustic alkalis. (4) Name three official root-

drugs which are destitute of starch. (5) Write the official names of two root-drugs which contain laticiferous tissue.

D—Wild Cherry. (1) Give its official name. (2) Botanical origin. (3) Natural order. (4) Habitat. (5) Describe Wild Cherry Bark. (6) Name its official preparations. (7) Give brief outline of the formulas for each. (8) What is the active constituent formed during the processes for these preparations? (9) Explain how this constituent is formed. (10) Give the dose of the strongest preparation of Wild Cherry.

E—Salicylic Acid. (1) Name three official liquids containing Salicylic Acid in combination. (2) Give a process for obtaining Salicylic Acid from one of these liquids. (3) To what is the alleged superiority of Salicylic Acid obtained from a natural source over that made from carbolic acid attributed? (4) What ordinarily causes the discoloration of solutions of Salicylates? (5) What are the dose and medical properties of Salicylic Acid?

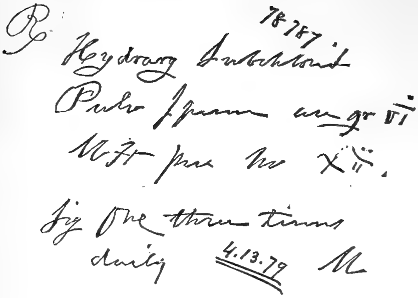
F—Precipitation. (1) What is usually the cause of precipitation in fluid extracts? (2) How would you prove that the precipitate should be filtered out? (3) In the following cases, state whether the liquid should be filtered before dispensing, and why. Oleoresina Cubebæ? Oleoresina Aspidii? Oleoresina Piperis? (4) Should filtration be resorted to before dispensing the following mixtures: Fluid Extract of Lupulin 25 c.c., Cinnamon Water 50 c.c.? Potass. Chlor. ʒiii; Tr. Ferri Chlor. ʒij; Glycerin, ℥ss.; Aqua. ad ℥iii. (5) Under what circumstances would Tincture Iodine 1 part, and Water 2 parts, mix without precipitation?

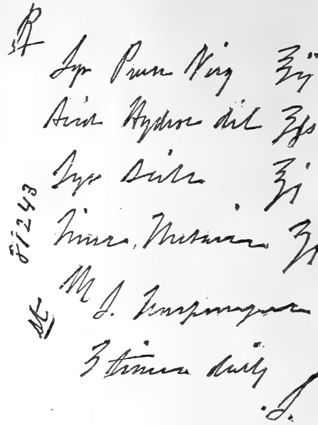
G—(1) Give two characteristic tests for Salts of Bismuth. (2) What acid is used to dissolve Metallic Bismuth? (3) Give three tests to distinguish between Salts of Lead and Bismuth. (4) Name four metals the salts of which are liable to contaminate those of Bismuth.

H—Powdered Opium. (1) Name the most important alkaloid which official Powdered Opium contains, and state the percentage of it that should be present. (2) At what temperature should Opium be dried when reducing it to powder? (3) Of what degree of fineness should the official powder be? (4) How would you reduce Powdered Opium of a high percentage of alkaloid to the official standard? (5) Give the official and common names of six preparations in which Powdered Opium is used.

I—Give the English name, botanical name of plant, natural order, habitat, and active principle of each of the following drugs: Pilocarpus. Cannabis Indica. Jalapa. Coriandrum. Myristica.

K—(1) Criticise and translate the following prescriptions, write out with English names ingredients and quantities, state whether you would compound them as written or what course you would pursue on receiving them.





SPECIMENS.

The following specimens were placed before the senior students for recognition during the several examinations :

Pharmacy.

Aqua chloroformi,
Syrupus zingiberis,
Syrupus acidi hydriodici,
Extractum cinchonæ fluidum,
Extractum sennæ fluidum,
Confectio rosæ,
Pulvis rhei compositus,
Adeps lanæ hydrosus,
Tinctura cardamomi composita,
Tinctura calumbæ.

Materia Medica.

Stillingia,
Aconitum,
Caulophyllum,
Rubus,
Euonymus,
Cascarilla,
Santalum rubrum,
Eriodictyon,
Absinthium,
Strophanthus.

Chemistry.

Aqua chlori,
Acetanilidum,
Sodii bicarbonas,
Potassii bromidum,
Ammonii chloridum,
Potassii ferrocyanidum,
Plumbi oxidum,
Potassii bitartras,
Sodii acetas,
Acidum sulphurosum.

Committee.

Aqua fœniculi,
Infusum digitalis,
Syrupus tolutanus,
Tinctura gentianæ composita,
Prunus Virginiana,
Granatum,
Buchu,
Acidum boricum,
Acidum tannicum,
Potassii ferricyanidum.

OPERATIVE PHARMACY.

(*1*) *Alcoholmetrical Test.*

Estimate the amount of alcohol in the sample of white wine ; put all calculations on the sheet of paper, with your name and examination number, and put clearly on the label the letter of the sample estimated.

(2) Bacilli.

Powd. Ext. of Glycyrrhiza	7·0 gm.
" Acacia	1·0 gm.
" Sugar	4·0 gm.
Syrup of Tolu . . . . q. s.	

Mix; make 15 Bacilli. Put in a paper box.

(3) Emulsion.

Make 100 c.c. of an emulsion which shall contain 50 per cent. of cod liver oil, by the *English method;* put in a bottle and place a label on the bottle, giving the proportions of each ingredient.

(4) Capsules.

Cinchonine Sulph	1·80 gm.
Powd. Capsicum	·50 gm.

Mix; fill into one dozen gelatin capsules.

N. B.—Empty capsules will be found in the round box.

(5) Plaster.

Spread a warming plaster for the side (shaped, with round corners), about 4 x 6 inches of plaster surface.

ANALYTICAL CHEMISTRY.

The examination in this branch consisted in the analysis of a mixture of from three to five salts or compounds in the form of powder. Each student was given two hours in which to carry out this work.

MICROSCOPY.

Make a sufficient number of sections, transverse, longitudinal-radial and longitudinal-tangential, of the specimen given you for study, and use such clearing agents, test solutions and stains as are necessary to determine the following points:

(1) Is the specimen derived from the pteridophyta, from the gymnosperms, from the monocotyls or from the dicotyls? (2) Is it from a root, from a stem or from a petiole? (3) Is it monostelic, polystelic or schizostelic? (4) To which of the following varieties do its vasal bundles belong: Closed collateral, open collateral, bi collateral, concentric with a central xylem, concentric with a central phloem, or phloem and xylem bundles distinct? (5) Make a diagram (not a detailed drawing) of the cross-section on a sufficient scale, and point out such of the following parts as are present: The xylem of a bundle, the phloem of a bundle, the pith, the epidermis, the periderm, a medullary ray, the endodermis and the pericycle. (6) Indicate which of the following tissues are present: Collenchyma, stone cells, bast fibres, ducts, tracheids, complex laticiferous tissue, simple laticiferous tissue, crystal cells, resin cells. (7) In case ducts occur, name the different varieties present. (8) If crystals are present, what is their composition? (9) Is starch present in the specimen, and by what means do you determine? (10) Is tannin present? If so, is it more abundant in the parenchymatous or in the prosenchymatous tissues? (11) What test did you apply to determine the presence or absence of tannin? (12) Judging by the structure, is the specimen from an aquatic

or from a land plant? State reason for your conclusion. (13) What tissues, if any, show lignification? Describe the test by which you determine. (14) What tissues, if any, show cutinization? How did you determine? (15) Are secretion reservoirs present? If so, state their location.

SEVENTY-FIFTH ANNUAL COMMENCEMENT.

The exercises connected with conferring the degree of Graduate in Pharmacy were held at the Academy of Music, Wednesday evening, April 15, at 8 o'clock.

Prayer was offered by W. N. McVickar, D.D.

President Bullock conferred the degree upon the following:

Name.	*Subject of Thesis.*	*State.*
Albaugh, Herbert Spencer,	*Structure of elder bark,*	Ohio.
Alexander, Charles Ellis,	*Effervescing caffeine and potassium bromide,*	Pennsylvania.
Arcularius, Harry Edward,	*Cocillana,*	Missouri.
Armstrong, Walter,	*Spiritus frumenti,*	Virginia.
Arndt, Harry, Jr.,	*Pharmaceutic degrees,*	Pennsylvania.
Aszmann, Louisa Henrietta,	*Carbolic acid,*	Pennsylvania.
Baer, Hermanus Ludwig,	*Estimation of sulphuric acid,*	Pennsylvania.
Baldauf, Leon Kahn,	*Tinctura iodi,*	Kentucky.
Barbiere, Francis Joseph,	*Rhubarb,*	Pennsylvania.
Barrett, Wesley Johnson,	*Phosphorus,*	Pennsylvania.
Bartho, Fremont Kessler,	*Sodii bicarbonas,*	Pennsylvania.
Bartlett, Hannah Frances,	*Magnolia glauca,*	New Jersey.
Becker, Irwin Atwood,	*Calx sulphurata,*	Pennsylvania.
Beckett, Josiah Bee,	*The pharmacist in emergencies,*	New Jersey.
Beeler, Aaron Wilson,	*The future of United States pharmacy,*	Ohio.
Bensinger, George Irvin,	*Datura stramonium,*	Pennsylvania.
Bode, Theodore Christian,	*Terpene,*	Kansas.
Bolton, Jr., Alfred Harrison,	*Syrupus ferri iodidi,*	Pennsylvania.
Boose, William Engelhart,	*Tabacum,*	Pennsylvania.
Booth, James Lofton,	*Kola nut,*	Mississippi.
Booth, Wm. Henry,	*Aqua hydrogenii dioxidi,*	Virginia.
Boyer, John Clinton,	*Arnica,*	Pennsylvania.
Brugler, Elmer George,	*Koumys,*	Pennsylvania.
Buehler, David Alexander,	*Sapo,*	Pennsylvania.
Buss, Marcus,	*Calcium and its compounds,*	Pennsylvania.
Cameron, Charles Sherwood,	*Naphtalinum,*	Maryland.
Campbell, Frank Book,	*Calx chlorata,*	Ohio.
Carman, Harry Alfred,	*Strophanthus,*	Pennsylvania.
Carstens, Louis Peter,	*Chemical analysis of locust bark,*	Iowa.
Case, Luella,	*The scale salts of iron,*	Ohio.
Cassel, James Wilson,	*Examination of commercial glucose,*	Pennsylvania.
Catherman, Isaac Newton,	*Lanolin,*	Pennsylvania.
Clair, Joseph Sylvester,	*Ipecacuanha,*	New Jersey.
Coller, William Warner,	*Cimicifuga racemosa,*	Pennsylvania

Name.	*Subject of Thesis.*	*State.*
Collins, John Hall,	*Pharmacy as a profession,*	Pennsylvania.
Cook, Wm. S. Gray,	*Percolating apparatus,*	Pennsylvania.
Craig, James,	*Tar and its preparations,*	Scotland.
Crayton, Frank Blair,	*Hypericum,*	South Carolina.
Crumbie, James Henry,	*Practical pharmaceutical education,*	Pennsylvania.
Daniels, Charles Rockford,	*Strontium,*	South Carolina.
Davis, John Ellsworth,	*Ergot,*	New Jersey.
Deemer, George Morton Hays,	*Glycerin,*	Pennsylvania.
DeGraffe, Bertha Leon,	*The tannins of some Ericaceæ,*	New York.
Dewees, William Holstein,	*Petroleum,*	Pennsylvania.
DeLorme, John Grenville,	*Geranium,*	South Carolina.
Dickinson, Chas. Seymour,	*Stearic acid,*	Pennsylvania.
Dietrich, Pierce Abbott,	*Cotton plants and derivatives,*	Pennsylvania.
Dill, Benjamin,	*Sponges,*	Pennsylvania.
Dougherty, Albert,	*Beef, wine and iron,*	Delaware.
Draper, Oscar Carmen,	*Variations in official tinctura opii,*	Delaware.
Dutt, William,	*Estimation of opium plaster,*	Ohio.
Ehman, Joseph William,	*Solution of magnesium citrate,*	Pennsylvania.
Elliott, Boyce,	*Problems confronting the American Pharmacist,*	South Carolina.
Farrell, Martin Edward,	*Cascara sagrada,*	Pennsylvania.
Farrow, Charles Taylor,	*Syrup of ipecacuanha,*	Pennsylvania.
Felker, Harry,	*Benzoin,*	Pennsylvania.
Fischer, Frederick Franklin,	*Oleum morrhuæ,*	Pennsylvania.
Fitzgerald, Samuel Walter,	*Tinctures,*	Pennsylvania.
Flenniken, John Byron,	*A pharmacist and the public,*	Pennsylvania.
Fluck, Franklin Wilson,	*Ethyl chloride,*	Pennsylvania.
Freeman, Josiah Kisterbock,	*Compressed tablets,*	Pennsylvania.
Gabriel, Robt. Rudolph,	*Cascara sagrada,*	Pennsylvania.
Geiger, Walter Samuel,	*Eriodictyon,*	Pennsylvania.
Genz, George Leonard,	*Commelina virginica,*	Wisconsin.
Goldsmith, Lee,	*Glycerin,*	Pennsylvania.
Good, Robert Franklin,	*Oleum gaultheriæ,*	Pennsylvania.
Graham, Harry Edgar,	*Therapeutics and hygeine,*	Pennsylvania.
Griesemer, James Adam,	*Electricity,*	Pennsylvania.
Griswold, Charles Maust,	*Acetic acid as a menstruum,*	Pennsylvania.
Haig, Jr., Charles Roberts,	*Acidum boricum,*	Pennsylvania.
Haines, Charles Henry,	*Unguentum aquæ rosæ,*	Maryland.
Hall, Robert Carson,	*Iodine,*	Pennsylvania.
Hance, George Headley,	*Pharmaceutical still,*	Pennsylvania.
Hannan, Frank William,	*Honey,*	Pennsylvania.
Harrell, Herbert Dean,	*Spirit of camphor,*	West Virginia.
Harris, Clarence Mulford,	*Cod liver oil,*	New Jersey.
Haymaker, Milo Miller,	*Stillingia,*	Missouri.
Hayman, Walter,	*Hydrargyri sulphidum rubrum,*	Pennsylvania.
Heckerman, Adam Bruce,	*Fluid extract of geranium,*	Pennsylvania.
Heffner, Edgar Franklin,	*Potassii chloras,*	Pennsylvania.
Heinbach, Frank Walton,	*Camphor,*	Pennsylvania.

Name.	*Subject of Thesis.*	*State.*
Helfrich, Edward Daniel,	*Podophyllum,*	Ohio.
Hellyer, Edwin Fayette,	*Acacia,*	Pennsylvania.
Herzog, Albert,	*Aqua hydrogenii dioxidi,*	Missouri.
Heyser, Jonas Edward,	*Advertising as a pharmacist,*	Pennsylvania.
Hiffmeyer, William Joseph,	*Belladonna,*	Pennsylvania.
Hippler, Harry Richmond,	*Fluid extracts,*	Pennsylvania.
Hodil, Frank Dilworth,	*Eucalyptus,*	Pennsylvania.
Holt, James Stephen,	*Cascara sagrada,*	Pennsylvania.
Howard, John Edgar,	*Water,*	Pennsylvania.
Humpton, Albert Norton,	*Roots and leaves,*	Pennsylvania.
Hunt, Warren Ernest,	*Administration of castor oil,*	Pennsylvania.
Ink, Charles Thomas,	*Camphor: its preparation,*	Ohio.
Ireland, Wm. Page,	*Belladonna,*	New Jersey.
Jackson, Thomas,	*Prescriptions,*	Pennsylvania.
Jacoby, Charles Nicholas,	*Antiseptics and disinfectants,*	Wisconsin.
James, Robert Rosser,	*Heraclei lanati fructus,*	Pennsylvania.
Johnson, Albert Burtis,	*Estimation of ammonium chloride tablets,*	New Jersey.
Johnson, Charlton Graham,	*Solanum Carolinense,*	Georgia.
Johnson, Olive Curtis,	*Assay of tincture of nux vomica,*	Pennsylvania.
Jones, John Comer,	*Sassafras,*	New Jersey.
Jones, Lester David,	*Emulsion of cod liver oil,*	Iowa.
Jones, Thomas Morgan,	*Mine water,*	Pennsylvania.
Kelchner, Charles Eber,	*Some criticisms of U. S. P., 1890,*	Pennsylvania.
Kelley, Alfred Logan,	*Camphor,*	Delaware.
Ketterer, Martin,	*Repercolation,*	Pennsylvania.
Killiam, William Smith,	*Cod liver oil,*	Delaware.
Kline, Frank,	*Iodine,*	Pennsylvania.
Knoefel, Arthur Eugene,	*Syrupi acidi hydriodici,*	Kentucky.
Kunz, Charles Cornelius,	*Calomel,*	Pennsylvania.
Lachenmayer, Henry Julius,	*Kola,*	Pennsylvania.
Laucks, William Irwin,	*Preparations of iron,*	Pennsylvania.
Lautenbacher, Wm. Roth,	*Strophanthus,*	Pennsylvania.
Lee, Harry Francis,	*Sumbul,*	Pennsylvania.
Leech, David Malcolm,	*Ipecacuanha,*	Pennsylvania.
Le Sage, George Louis,	*Acetum opii—1850 U. S. P.,*	New York.
Leslie, Harry Carter,	*Assay of acetic acid,*	Pennsylvania.
Lewis, Howard Hornberger,	*Cod liver oil,*	Pennsylvania.
Light, James Raymond,	*Infusum digitalis,*	Pennsylvania.
Littlefield, Bradford Allen,	*Potassa sulphurata,*	New York.
Lloyd, Ephraim Augustus,	*Kaolin,*	New Jersey.
Longmire, Charles Henry,	*Iron, its preparations and uses,*	Pennsylvania.
Luburg, Leon Franklin,	*Glycerin suppositories,*	Pennsylvania.
McConomy, Paul Lucien,	*Pills,*	Pennsylvania.
McCracken, James Henry,	*Estimation of tannin in fluid extract of Rhus glabra,*	Pennsylvania.
McHenry, Walter Greenleaf,	*Ipecac and its preparations,*	Pennsylvania.
McLaughlin, Chas. Bishop,	*Rhizome of Smilacina racemosa,*	New Jersey.

Name.	*Subject of Thesis.*	*State.*
Malsbury, Hillman Gaskill,	*Successful pharmacist,*	New Jersey.
Maples, Murff Ford,	*Acidum sulphurosum,*	Colorado.
Martin, Merry Omah,	*Palmetto,*	Mississippi.
Marshall, Charles Gross,	*Diluted hydrochloric acid,*	Pennsylvania.
Meier, August Jacob,	*Pyroligneous spirit,*	Germany.
Meredith, Charles Howard,	*Kaolin,*	Pennsylvania.
Metz, Abram Lehman,	*The ideal pharmacist,*	Pennsylvania.
Miller, James Augustus,	*Balsam of tar,*	Iowa.
Miller, John Henry,	*Hydrochloric acid U. S. P.,*	Pennsylvania.
Moleen, George Arnold,	*Cocillana,*	Colorado.
Montgomery, John Custis,	*Present art of Galen,*	Pennsylvania.
Moore, George Cooper,	*Asafœtida,*	Delaware.
Mosebach, Ferdinand Adam,	*Syrup of iron iodide,*	Pennsylvania.
Mountaine, Wm. Lewis,	*Extractum theæ fluidum,*	Maine.
Musselman, John,	*Professional pharmacy,*	Pennsylvania.
O'Donnel, David Howard,	*Dorema ammoniacum,*	Pennsylvania.
Page, Edward Lewars,	*The chemist in pharmacy,*	Pennsylvania.
Parker, Howard Eugene,	*Orchids,*	Connecticut.
Pellett, Edmund Burnham,	*Pills,*	Pennsylvania.
Phillips, Wm. Newton,	*Iodine,*	Ohio.
Pierce, Herman Judson,	*Chemical analysis of Canada thistle,*	Pennsylvania.
Pilgrim, John W.,	*Opium,*	New Jersey.
Place, Charles Ross,	*Estimation of phosphoric acid,*	Pennsylvania.
Post, Edward Meigs,	*Goulard's extract,*	New Jersey.
Powell, Charles Deitz,	*Sulphur,*	Pennsylvania.
Pulsifer, James Perlie,	*Syrupus Pini albi compositus,*	New Jersey.
Reed, Arthur Benjamin,	*Gelatin,*	Pennsylvania.
Reeve, James Whitaker,	*Suppositories,*	Pennsylvania.
Rewalt, Jay Wm.,	*Cascara sagrada,*	Pennsylvania.
Richardson, Neafie,	*Scale pepsin,*	New Jersey.
Ricker, Wm. Homer,	*Tobacco,*	Pennsylvania.
Roach, Charles Peter,	*Sodium bisulphite,*	Pennsylvania.
Robinson, Raleigh,	*Vanilla,*	Pennsylvania.
Ross, Frank Budd,	*Ferrum,*	New Jersey.
Rovno, Pinkas,	*Acidum sulphuricum dilutum,*	Russia.
Rudy, Harry Robert,	*Spongia usta,*	Maryland.
Ryland, George Bertram,	*Cork,*	Maryland.
Sager, Verner Edward,	*Mecca oil,*	Ohio.
Sallada, Hunter Albert,	*Crystallization,*	Pennsylvania.
Schabinger, Charles,	*Zea,*	Delaware.
Schad, Harry John,	*Grape juice,*	Pennsylvania.
Schaeffer, Otis Oliver,	*Estimation of caffeine in kola,*	Pennsylvania.
Schindel, David Philip,	*Preservation of syrups,*	Maryland.
Schmieg, Joseph Alphonse,	*Petroleum,*	Pennsylvania.
Schneider, Kingsley Clark Thompson,	*Fluid extract of coca,*	Ohio.
Schnurman, Harry Samuel,	*Fungi as medicine,*	Pennsylvania.
Schroeder, Johann Heinrich,	*Chemistry of some cassias,*	Germany.

Name.	*Subject of Thesis.*	*State.*
Scott, Jas. Patrick Edward,	*Nux vomica,*	Pennsylvania.
Sellers, Walter Spangler,	*Mentha piperita U. S. P.,*	Pennsylvania.
Semmel, Frank Pierce, Jr.,	*Extractum nucis vomicæ,*	Pennsylvania.
Seyforth, Julius Frederic,	*Acetic acid in pharmacy,*	Kansas.
Sharp, Warren Reed,	*Acetanilidum,*	Pennsylvania.
Shenk, John Benjamin,	*Grindelia,*	Pennsylvania.
Sherwin, Robert Suthers,	*Syrupus pini albi compositus,*	Pennsylvania.
Shreve, Alexander,	*Cannabis sativa,*	New Jersey.
Simpler, Willard Eugene,	*Salicylic acid,*	Pennsylvania.
Sisler, Loerey Wm.,	*Chloralhydrate,*	Pennsylvania.
Smith, John Ritner,	*Pills, ointments and plasters,*	Pennsylvania.
Smith, Paul,	*Acetylene,*	Pennsylvania.
Spath, George Balthaser,	*Stoichiometry,*	Pennsylvania.
Spotts, Albert Oyster,	*Boric acid,*	Pennsylvania.
Stahel, Albert William,	*Belladonna,*	Wisconsin.
Steadman, Merril Linn,	*Estimation of ammonium chloride,*	Pennsylvania.
Stephens, Halsey De Forrest,	*Wintergreen,*	New Jersey.
Stevens, Thomas Ray,	*The pharmacist as a bacteriologist,*	Indiana.
Stine, Howard F.,	*Aromatic spirit of ammonia,*	Pennsylvania.
Stout, Edward Clayton,	*Antipyrin,*	Pennsylvania.
Stroup, Freeman Preston,	*Oleum Cicutæ maculatæ,*	Pennsylvania.
Stump, Adam Franklin Marshall,	*Ergota,*	Pennsylvania.
Swainbank, Charles Miller,	*Fabiana imbricata,*	Pennsylvania.
Swartz, Calvin I.,	*Elixir of iron, quinine and strychnine,*	Delaware.
Thompson, Alexander Peterson,	*Poisons,*	Pennsylvania.
Thrush, Morris Clayton,	*Solanum Carolinense,*	West Virginia.
Thum, John Carl,	*Liquor magnesii citratis,*	Pennsylvania.
Tiefenbach, Jacob Fred.,	*Preparation of zinc oxide,*	Pennsylvania.
Towles, Therret Rankin,	*Assay of aromatic sulphuric acid,*	Kentucky.
Townsend, James Vaughan,	*Analysis of Dover's powder,*	New Jersey.
Waldner, Paul Jacob,	*Stramonium,*	Pennsylvania.
Wasley, Fred. Stanley,	*Passiflora,*	Pennsylvania.
Watkins, Mack McInnis,	*Zinc oxide ointment,*	Mississippi.
Watson, Jonathan Ingham,	*Coptis trifolia,*	Pennsylvania.
Weida, Charles Arthur,	*Acetylene,*	Pennsylvania.
Weiss, William Erhard,	*Assay of fluid extract of coffee,*	Ohio.
Weston, Edythe,	*Assay of fluid extract of guarana,*	Delaware.
Whitacre, Lewis Reese,	*Aluminium,*	New Jersey.
Wild, George Fred.,	*Aromatic spirit of ammonia,*	Indiana.
Williamson, Thomas McGill,	*Assay of manna,*	Maryland.
Wilson, Willets,	*Licorice,*	New York.
Wissmann, Herman Bayard,	*Glycerite of carbolic acid,*	Pennsylvania.
Woltman, Enos Frederick,	*Abrus precatorius,*	Pennsylvania.
Young, Ben Lee,	*Chlorine in nitric acid,*	Alabama.
Ziegler, John Clayton,	*Spermaceti,*	Pennsylvania.
Zipp, Charles James,	*Acid salicylicum,*	New York.
Zullinger, Aaron Henry,	*Syrupus hypophosphitum U.S.P., 1890,*	Pennsylvania.

STATES AND COUNTRIES REPRESENTED BY THE GRADUATING CLASS.

Alabama	1	Kentucky	3	Russia	1
Colorado	2	Maine	1	Scotland	1
Connecticut	1	Maryland	6	South Carolina	4
Delaware	8	Mississippi	3	Virginia	2
Georgia	1	Missouri	3	West Virginia	2
Germany	2	New Jersey	20	Wisconsin	3
Indiana	2	New York	5		
Iowa	3	Ohio	11	Total	221
Kansas	2	Pennsylvania	134		

Special certificates for a two years' course in general, applied and analytical chemistry were awarded to:

Irwin Atwood Becker, Pennsylvania.
William Joseph Doyle, Iowa.
Warren Whitney Flitcraft, New Jersey.
Clarence Blaine Gowen, Georgia.
John Clayton Ziegler, Pennsylvania.

AWARD OF PRIZES.

The Procter Prize of a gold medal and certificate for the highest grade of scholarship and a meritorious thesis was given to Louis P. Carstens. In connection with this, Harry R. Rudy received the grade of distinguished, and L. K Baldauf and J. Henry Schroeder the grade of meritorious.

The Maisch Memorial Prize of a Zentmayer microscope, offered by the family of the late Professor Maisch, for original histological work on American plants, was awarded to Charlton G. Johnson. The following graduates received honorable mention therewith: M. C. Thrush, Charles B. McLaughlin, H. Frances Bartlett, and Robert R. James.

The Chemical Prize of an analytical balance, offered by Professor Samuel P. Sadtler for original quantitative analysis, was given to J. Henry Schroeder, with honorable mention of Bertha L. DeGraffe and Freeman P. Stroup.

The American Journal of Pharmacy Prize of $25, offered by Professor Henry Trimble, was awarded to Bertha L. DeGraffe, with honorable mention of J. Henry Schroeder.

The Herbarium Prize of $25 in gold, offered by Professor Edson S. Bastin for the best collection of herbarium specimens, was awarded to Bertha L. DeGraffe.

The John M. Maisch Prize of $20 in gold, offered by Mr. J. H. Redsecker, of Lebanon, Pa., for histological knowledge of drugs, was given to Harry R. Rudy, with honorable mention of Louis P. Carstens, Leon K. Baldauf, Bertha L. DeGraffe, Edgar F. Heffner, Edward D. Helfrich, Herman J. Pierce and J. Henry Schroeder.

The William B. Webb Memorial Prize, consisting of a gold medal, for general excellence in operative pharmacy, specimens and committee examinations, offered by Mrs. Rebecca T. Webb, was awarded to Louis P. Carstens, with honorable mention of Harry R. Rudy and Thomas R. Stevens.

The Operative Pharmacy Prize of $25 in gold, offered by Professor Joseph P. Remington for the best examination in that branch, was given to Olive C.

Johnson, with honorable mention of Louis P. Carstens, Charles B. McLaughlin and Harry R. Rudy.

The Robinson Chemical Prize of a gold medal and certificate, offered by Mr. James S. Robinson (Class of 1869), of Memphis, Tenn., for the best examination in general and analytical chemistry, was awarded to Jonathan I. Watson.

The valedictory address was given to the graduating class by Professor Edson S. Bastin.

The farewell supper of the professors to the graduating class was given in the Museum of the College, Tuesday evening, April 14th. The officers and trustees of the College were present, with a number of invited guests, and a pleasant evening was passed in disposing of the menu and in listening to the choice selections rendered by the students' orchestra.

ALUMNI ASSOCIATION OF THE PHILADELPHIA COLLEGE OF PHARMACY.

The Thirty-second Annual Meeting of the Alumni Association of the Philadelphia College of Pharmacy was held in Alumni Hall, at the College Building, No. 145 North Tenth Street, on Monday afternoon, April 13, 1896.

President Jacob S. Beetem, '78, presided, and read his annual address, in which he said: "To-day we miss the familiar face of one who, for twenty-seven years, never missed an annual meeting of the Alumni Association, during which period he held the office of Treasurer. In the death of Edward C. Jones, our Association has lost one of its organizers, the spirit who held together and nursed it in its infancy, and faithfully stood by it in its youth and manhood. In fact, it has been said he was for several years "the Alumni Association." He did a great amount of valuable work for the Alumni, was faithful and correct, had the full confidence of his associates, and deserved it. His life was a patient devotion to what he undertook to do, and he always had pleasure in doing it. His earthly reward was 'thank you,' and we may truthfully say of him: 'Well done, good and faithful servant.' He is honored in perpetuating his memory in the Edward C. Jones Free Scholarship, and I earnestly ask every graduate and friend of Edward C. Jones to subscribe towards this Memorial Fund. It is estimated that $2,000 is necessary to carry out the proposed plan, of which amount $440.15 has already been paid into the treasury, with several dollars subscribed."

The President also recommended that the *Alumni Report* be issued each month of the year, instead of nine issues, as it is now, and that it be placed upon a subscription basis of 50 cents per year to our membership, and that all the students receive it gratuitously.

The Secretary, Wm. E. Krewson, '69, presented his Sixteenth Annual Report as Secretary, in which he reviewed the work of the Association for the past year.

During the year, 220 new members were added—8 who paid the required fee, 35 who were members of previous College Review Quiz Classes and who were deferred last year on account of being under age, and 177 who were members of this year's College Review Quiz Class.

The membership now numbers 2,710, after deducting those who have died, making a net gain of 200 new members for the year.

The report of the Memorial Committee showed that 20 of the members had died during the year.

The Secretary also paid a tribute to our late Treasurer, Edward C. Jones, and suggested that, upon each anniversary of his death, his last resting-place be strewed with flowers, as a tribute to his memory.

The Treasurer, Wm. L. Cliffe, '84, reported the receipts from all sources, $4,103.80, and the disbursements, including balance due College as quiz money for 1894 and 1895, and balance of donations to electric plant fund, $3,836.86, leaving a balance in the treasury of $266.94.

The Committee on Revision of By-Laws presented a complete set of new by-laws to conform to the new charter, which, after a few minor alterations, were unanimously adopted.

The following officers were elected for the ensuing year:

President, Dr. J. Louis D. Morison, '88; First Vice-President, Harry L. Stiles, '85; Second Vice-President, James C. Perry, '91; Treasurer, Wm. Lincoln Cliffe, '84; Secretary, Wm. E. Krewson, '69; Corresponding Secretary, F. Wm. E. Stedem, '82. Board of Directors, for three years: Wallace Procter, '72; C. Carroll Meyer, '73; Wm. A. Bullock, '86, and Theodore Campbell, '93; for two years, to fill two vacancies: Jacob S. Beetem, '78, and Cornelius E. Spencely, '78. Second Vice-President Jos. Crawford, '84, positively declined the nomination for any office, on account of pressure of business duties.

The thirty-second annual reception, to the seventy-fifth graduating class, was held in Association Hall, corner Fifteenth and Chestnut Streets, on Monday evening, April 13, 1896, and was a very successful and pleasant event.

An interesting concert programme was played by Bastert's Parlor Orchestra. President Jacob S. Beetem presided, and made a few introductory remarks, and welcomed the new members.

Charles Howard Meredith, of Media, Pa., delivered the annual class oration, which was well rendered, and he paid a glowing tribute to our late Treasurer, Edward C. Jones; Freeman Preston Stroup, of Rouseville, Pa., recited the poem dedicated to the graduating class; Charles Thomas Ink, of Columbiana, O., gave the history of the Class of 1896; and Kingsley C. T. Schneider, of Berea, O., foretold the future of the class in a highly creditable manner.

The Alumni Gold Medal was presented to Louis Peter Carstens, of Davenport, Ia.; and the eight prize certificates, for the highest general average in each of the branches, were awarded to the following students:

Pharmacy, John Henry Miller, Ephrata, Pa.; chemistry, Johann Heinrich Schroeder, Bossum, Germany; materia medica, Edgar Franklin Heffner, Centralia, Pa.; pharmacognosy (specimens), Jos. Wm. Ehman, Williamsport, Pa.; general pharmacy (committee), Leon Kahn Baldauf, Henderson, Ky.; operative pharmacy, Miss Olive Curtis Johnson, Danville, Pa.; analytical chemistry, Aaron Henry Zullinger, Chambersburg, Pa.; microscopical botany (vegetable histology), Robert Suthers Sherwin, Scranton, Pa.; for the best collection of indigenous plants, Albert Wm. Stahel, Roscobel, Wis. The prize for the highest general average of the Junior Class, to Clarence Osborne Snavely, Lebanon, Pa.

A new departure was inaugurated this year in the presentation of the prize certificates. All of the successful prize students were invited upon the platform, when the certificates were presented by David H. Ross, collectively, to them, and Johann H. Schroeder accepted them in a neat speech. W. E. K.

MINUTES OF COLLEGE MEETINGS.

PHILADELPHIA, March 30, 1896.

The stated annual meeting of members of the College was called this day, at 4 o'clock P.M., President Chas. Bullock in the chair. The chairman announced in suitable words the recent demise of Robert England, member of the College and of its Board of Trustees. It was, on the motion of William J. Jenks, resolved that, as an expression of profound sorrow, and as a tribute of respect, the business of the meeting be deferred and the session adjourned.

Meeting thereupon adjourned. WILLIAM B. THOMPSON,
Secretary.

PHILADELPHIA, April 6, 1896.

The adjourned annual meeting of members of the College was held this day, at 3.30 P.M., Vice-President Jenks presiding.

The minutes of the previous stated meetings were read and adopted. The records of transactions of the Board of Trustees for January, February and March, 1896, were presented, and on motion approved. The usual annual reports of officers and permanent committees were now requested. The Committee on Publication submitted a general statement, with financial transactions for fiscal term of 1895 and 1896. The finances of the committee were shown to be in a satisfactory condition. The increase of receipts during the year was $375.60, and increase of expenses $97.06, leaving a net increase of $278.54. The number of subscribers was also shown to have increased materially.

The editor of the AMERICAN JOURNAL OF PHARMACY submitted the following:

"This report covers the period from April 1, 1895, to March 1, 1896, inclusive. During that time there have been published 74 original papers from 36 authors. These were exclusive of editorials and reviews, and only included papers prepared solely for this JOURNAL. While the number of such papers diminished by 5 from those of the previous year, yet they exceeded the space occupied, by 77 pages. The number of pages of such original matter during the past year has been 374, against 297 pages the previous year, and 159 pages two years ago. It will be seen that, on including editorials, reviews, minutes of the College and Pharmaceutical Meetings, there has been but little space for abstracts from other journals.

Of the 36 authors contributing original matter, 13 were members of the College and 23 were not, thus indicating that the JOURNAL has liberal support outside of the membership of the College. The members contributed 41 papers and the non-members 33.

The illustrative features have been continued on a rather more liberal scale than during the preceding year, and this move has met with the hearty approval of both subscribers and contributors. 17 of the papers were accompanied by

illustrations, numbering 76 separate figures, or an average of 6⅓ for each number.

The total number of pages of reading matter during the year was 642, an average of 53½ pages for each issue, the same as the preceding year."

The report was accepted.

The Curator presented a statement, a brief summary of which is as follows:

"Your Curator would respectfully report that the resolutions passed at the last annual meeting of the College, to make certain improvements in the Museum, have been carried out, and in consequence the shelf room has been rearranged to accommodate fully 50 per cent. more specimens. But even with this extension, the time is fast approaching when more and more shelf room will be required to accommodate the specimens. Your Curator has now in process of rearrangement the entire collection of the Museum on a basis of classification that is simpler and more ready of access than the plan heretofore followed.

"The additions to the Museum during the year have been many and interesting, and in this connection the College Pharmaceutical Meetings have been no small factor in inducing presentations of specimens. I am,

"Yours respectfully,

"J. W. ENGLAND,

Philadelphia, March 30, 1896. "*Curator.*"

The Librarian summarized the state of the Library and the receipt of volumes as follows:

"The Librarian respectfully reports that, during the year 1895, there have been added to the Library by donation 3,183 volumes, in addition to the exchanges made by the JOURNAL OF PHARMACY, and by purchase twenty-eight volumes, many of them being works of great interest to botanical and chemical science. The Library is being more and more consulted by both members and students, and by others who find works of reference in our Library not accessible elsewhere.

"During the year there have been spent $93.05 for binding, and $218.58 for new books. All of which is respectfully submitted."

All of the above were ordered to be inscribed on the minutes of the College.

The Special Committee on Delinquent Members concluded their business, presented the facts as ascertained by them, and recommended that those whose names were indicated should be dropped from the roll of the College, as being delinquent, and more than *three* years in arrearage of dues. The recommendation of the committee was sustained by a unanimous vote of the members, and the committee discontinued.

Dr. Adolph W. Miller read letters of acknowledgment from Dr. Frederick Hoffman, at Berlin, Dr. Oscar Loew, of Tokyo, Japan, and Mr. P. L. Simmonds, of London, in response to notice of their election as honorary members of this College.

Prof. F. G. Ryan offered the following resolutions, which, after being discussed with some difference of opinion, were adopted, and the Secretary was directed to transmit a copy to each representative in Congress from Pennsylvania.

Resolutions offered and passed at meeting of members of Philadelphia College of Pharmacy, by Prof. F. G. Ryan:

Resolved, That it is the sense of the Philadelphia College of Pharmacy that the general adoption and use of the metric system of weights and measures in the United States is very desirable, and would prove of great benefit to the people; that our trade relations with other nations would be stimulated by the unity of weights and measures.

Resolved, That we approve of and heartily endorse the Bill now before Congress, known as H. R., No. 7,251, introduced by the Honorable C. W. Stone, making the metric system the legal standard of weights and measures for the United States.

Resolved, That a copy of these resolutions be sent to each representative in Congress from the State of Pennsylvania.

The Chairman appointed the following-named gentlemen to represent this College at the sessions of the Pennsylvania Pharmaceutical Association, at Mt. Holly Springs, in June next: William McIntyre, Henry Trimble and Dr. C. B. Lowe. On motion to proceed to nominations and election of officers of the College for the ensuing year, the following were duly chosen:

President, Chas. Bullock; First Vice-President, Robert Shoemaker; Second Vice-President, William J. Jenks; Treasurer, James T. Shinn; Corresponding Secretary, A. W. Miller; Recording Secretary, Wm. B. Thompson; Curator, Jos. W. England; Librarian, Thomas S. Wiegand; Editor, Henry Trimble; Publication Committee, Henry N. Rittenhouse, Samuel P. Sadtler, Wallace Procter, Joseph W. England; Trustees for three years, T. Morris Perot, Jos. P. Remington, Edson S. Bastin; Trustee for unexpired term of Robert England, deceased, William L. Cliffe.

Meeting, on motion, adjourned.

WILLIAM B. THOMPSON, *Secretary.*

SEVENTY-FIFTH ANNIVERSARY OF THE PHILADELPHIA COLLEGE OF PHARMACY.

On Wednesday evening, April 22, 1896, the College celebrated her seventy-fifth anniversary by a banquet in the Museum, and a display in the Library of the literature thus far contributed by members and Faculty. About one hundred and fifty guests assembled in the Library, where the above-mentioned exhibit was inspected, as well as one of selections from the Martindale herbarium. About 8 o'clock the company proceeded to the Museum, which had been temporarily fitted up as a banquet hall, where dinner was served, after which addresses were made by some of the invited guests and members of the College.

Prof. Joseph P. Remington acted as toast-master, and the first proposed was "Our City," responded to by the Mayor, Hon. Charles F. Warwick. The President of the College, Mr. Charles Bullock, followed with a brief history of the College. The other speakers were: Dr. William Pepper, on "The University of Pennsylvania;" Dr. Edward Brooks, on "Technical Education;" Hon. George S. Graham, District Attorney, on "Pharmaceutical Legislation;" Dr. J. W. Holland, Dean of the Jefferson Medical College, on "Our Sister College;" Hon. A. K. McClure, on "The Press;" Dr. Adolph W. Miller, on the "Alumni Association," and Dr. Horatio C. Wood, on the "Medical Profession."

The room was profusely decorated with tropical plants, and the proceedings were interspersed with choice musical selections by the orchestra.

A feature of the entertainment was the elaborate souvenir menu, which contained pictures of all the buildings that had been occupied by the College, and a historical record of the progress and development of the College since its foundation.

The success of the evening was largely due to the persistent efforts, during several months past, of Mr. Howard B. French, Chairman of the Entertainment Committee.

A more detailed account of this interesting occasion will be published shortly in the *Alumni Report.* Those of our readers who desire copies can have them mailed free by addressing the *Alumni Report*, 145 North Tenth Street, Philadelphia.

OBITUARY.

CHARLES O. CURTMAN.

Dr. Charles O. Curtman, of the Missouri Medical College, died on the morning of April 22d, after ten days' illness, from the effects of the grippe.

ROBERT ENGLAND.

Robert England, son of William and Hannah England, was born at Passyunk Road and South Street, this city, on February 21, 1825, and died of capillary bronchitis, after a short illness, at his home, southwest corner of Tenth and Catharine Streets, on March 29, 1896. Funeral services were held in St. Paul's M. E. Church, Catharine Street, above Sixth, on April 1, and at Mt. Moriah Cemetery.

In early youth, Mr. England was apprenticed to John W. Simes, druggist, at Eighteenth and Market Streets, for a term of nine years, "to learn the art, trade and mystery of a druggist and an apothecary." In 1847 he started in the drug business for himself, at the southeast corner of Tenth and Christian Streets. Remaining there three years, he moved up one square to the southwest corner of Tenth and Catharine Streets, where he has carried on business for nearly half a century. He was one of the oldest living graduates of the Philadelphia College of Pharmacy, having received his diploma on March 16, 1846, his thesis being entitled "American Ipecac." From the day of his graduation he evinced the deepest interest in the welfare of his *Alma Mater* and every movement which aimed for her advancement was assured in advance of his sympathy and outspoken support. Elected a member of the College on November 8, 1859, he was made a member of the Board of Trustees on September 28, 1874, and has been continuously re-elected, serving on many important committees. He never forgot the trials of student days, and always had a warm word of sympathy for the interests of the "boys," as he called them, whenever they needed some one to speak in their behalf.

Elected a member of the Alumni Association at the first annual meeting in 1864, he soon saw the power for good its members might wield, as an organized body, on behalf of the *Alma Mater* and the interests of pharmacy. And in the early years of the Association, when friends were few and interest lax, he strove with earnestness to promote its growth and advance its welfare.

During the Civil War he was apothecary to the Volunteer Corps stationed in the lower part of the city. In 1855 he was elected a member of the Board of Health of Philadelphia. For many years he was President of the Third Sectional School Board. About fifteen years ago he was nominated by the reform element of the ward for Select Council, and received the endorsement of the Committee of One Hundred.

The Pharmaceutical Examining Board of the City of Philadelphia was created in 1872, and at the request of Mayor Stokley—who had been vested by the Legislature with the power of appointing its members—the Philadelphia College of Pharmacy submitted names of representative pharmacists for appointment on the Board. Mr. England's name was on this list, and, after appointment, he served as a member of the Board, and as its treasurer, until it went out of existence in 1887, upon the passage of the law creating the State Examining Board. The local law, at the time of its passage, was very unpopular, but the aggressive and yet tactful work of the Board—of which Mr. England was a most active member—soon won the respect of local druggists, and paved the way towards the passage of the State law.

Mr. England believ d that one of the evils of the drug trade was that many pharmacists confined their energies too closely to their every-day work, instead of allying themselves with interests in the world at large, and that such action, in view of the very detailed nature of the drug business, must oftentimes result in the taking of a too contracted view of life and its real purposes. Hence, he actively identified himself with a number of charitable and educational institutions. He was a member of St. Paul's Methodist Episcopal Church, and treasurer of the Board of Sustentation of the Philadelphia Methodist Conference. He was treasurer of the Philadelphia Conference Tract Society, a manager of the Church Extension Society, a trustee of the Philadelphia House of Industry, and a director of the Moyamensing Soup Society.

Robert England's sterling qualities were his sturdy manliness, his high ideals of life, his firmness of purpose, and his earnestness in fighting for the right, be the result what it might. Allied with these was a singularly genial and happy temperament that persisted all through life's sunshine and shadows, and brought pleasure into the lives of many. Generous to a fault, his greatest happiness was in making others happy, and the memory of his being will live in the hearts of his friends through the years to come.

His wife, two sons and four daughters survive him. Both sons are graduates of the Philadelphia College of Pharmacy—the one, Joseph W., of the Class of '83, the other, William T., of the Class of '92.

W. E. K.

NOTES AND NEWS.

The University of Chicago has established a department of botany, with J. M. Coulter as chief professor. On this account the *Botanical Gazette* has passed into the possession of the same institution, and will be issued by it in the future.

Professor Wyndham R. Dunstan, of the Pharmaceutical Society's Research Laboratory, London, has resigned, to accept the directorship of the Department of Scientific and Technical Research in the Imperial Institute. His work in the future will deal with the vegetable products of the Colonies and India.

The *Chicago College of Pharmacy* has become a department of the Illinois State University, and will remain located in Chicago.

Mistura Ferri Composita is best made, according to W. Johnston (*Phar. Journal*, March 7, 1896), by dissolving the sugar with the ferrous sulphate instead of mixing it with the myrrh and potassium carbonate. To get a really good emulsion, the myrrh (nice, oily pieces) should be rubbed hard with the alkali till it becomes not only pulverulent but pasty, before adding any rose water. When that is done, the emulsion can (when diluted) be safely strained through coarse muslin, to remove bits of bark, etc.

The following conclusions concerning *papain as a digestive agent* have been reached by D. B. Dott (*Phar. Jour.*, March 7, 1896):

(1) That the solvent action of the menstruum alone must be taken into account in experiments conducted on this subject.

(2) That dried papaw juice, and the papain prepared from it by purification and precipitation, have very little solvent action on albumin, either in alkaline or acid solution.

(3) That one brand of commercial papain has very slight solvent action in alkaline solution, but considerable action in acid solution; in these respects resembling a mixture of papain and pepsin.

(4) That even the commercial papain has not nearly the solvent action on albumin which is possessed by pepsin.

The *Therapeutische Wochenschrift*, for April 5th, remarks that lithium bitartrate is much employed by American physicians in the treatment of Rigg's disease (pyorrhœa alveolaris), on the theory that that form of suppurative gingivitis is of a gouty nature. The calcareous collections about the roots of the teeth are said to contain, besides the ordinary calcium carbonate and phosphate, a considerable amount of uric acid, calcium urate, and sodium urate. Dr. E. C. Kirk is cited as having found the lithium bitartrate a remarkably efficacious remedy in this affection, superior to any other lithium salt. Its diuretic action is manifest in many cases, but with some persons it acts as a laxative. Five grains may be given three times a day, dissolved in carbonic acid water.

The other preparation is *lithium bromide*, the efficacy of which in gout is attributed by Mendelsohn to its diuretic effect rather that to any solvent action of the salt. Polakow uses lithium bromide in the following prescription:

	Parts.
Lithium bromide	1 to 2
Sodium bicarbonate	4
Distilled water	200

M. Sig.: Three or four tablespoonfuls to be taken in the course of twenty-four hours.—*N. Y. Med. Jour.*, April 25th.

Tubercles on the Roots of the Soja Bean.—Professor Kirchner (*Cohn's Beiträge zur Biol. der Pflanzen*, xvii, 2, 1895) has conducted a few remarkably interesting experiments in regard to the production and character of these swellings. When the soja beans were cultivated in good soil, such as one would ordinarily employ for experimental purposes, no conspicuous tubercles were formed; but

when to this soil was added a small amount of earth brought from Japan, and presumably infected with the bacteria associated with the plant, tubercles were abundantly formed, and the plants grew more thriftily than under previous conditions. The soil came from Japan in well-soldered metallic boxes. It was black, uncommonly light volcanic ash. It was moist when it arrived, and contained fragments of the roots of the soja plants which had been cultivated therein.

While the observation is not wholly new, it confirms some kindred results, and tends to open up still farther the possibility of more successful cultivation of *Papilionaceæ* in infected soil. Gonnermann (Land. w. Jahr-b. xxii, 1894) has apparently demonstrated that root tubercles are not produced by only one species of bacterium, varying, as some have thought, according to the kind of soil in which they occur.

Although much advance has been made in the direction of settling some of these disputed points, a great deal remains to be learned in regard to turning the observations to practical account. Two of our Southern plants, the so-called "cow-pea" in its multiform varieties, and *Arachis*, appear to be the best subjects of research in this department. The increasing utility of the former as a direct or indirect fertilizer, and of the latter in its new applications in the production of a food, after the extraction of the oil, indicates the desirability of experiments at the Southern stations.—*American Journal of Science.*

Formation of Chlorophyll and Starch.—A very extended series of observations on the mode of formation of starch grains and chlorophyll bodies in plants has led M. E. Belzung to the following general conclusions: The first process which takes place in the embryo is the formation of starch, the result of the activity of the protoplasm, the chorophyll body being a secondary formation. With but few exceptions the chlorophyll pigment is diffused through the protoplasm of the young embryo. The substratum of the future chlorophyll body—leucite or plastid—is always fully formed by the time the seed arrives at maturity; the protoplasm has always a reticulate structure; it is the protoplasm of the amyliferous vacuoles which constitutes the chromatophore or leucite. Those starch grains which are destined to constitute the reserve food material in the ripe seed are an exception to this rule, and increase in the meshes where they are originally deposited. In proportion as the embryo becomes green, and the mass of green corpuscles more abundant, the starch grains are resorbed; they form a part of the material for building up the green chlorophyll grains. In adult green organs, especially leaves, the starch grains which are formed in the light in the chlorophyll bodies are a result of the assimilating power of these latter, being one of the products of the substance itself of the chlorophyll bodies, a kind of secretion from the green substance. The resorbtion of the chlorophyll, which in leaves takes place only at the period of the autumnal fall, is, on fruits, effected almost entirely before they ripen. The two essential phases in the life of a plant—the embryonal phase, during which the green cell is built up at the expense of materials which it has not elaborated, and the adult phase, in which its formative activity is manifested by new embryonal conditions—constitute a remarkable example of organic reversibility.—Morot's *Journal de Botanique*, vol. ix, 1895 (through the *Pharmaceutical Journal*, January 25, 1896).

THE AMERICAN
JOURNAL OF PHARMACY

JUNE, 1896.

THE PHARMACOPŒIAL STANDARD.[1]

By J. U. Lloyd.

In introducing this subject, I realize that I am stepping on rather dangerous ground, because whoever presumes to touch upon the matter in a spirit of a somewhat adverse criticism, is sure to be severely scolded, and, as I admit, for good reasons.

Experts have given their time freely to the construction of that monumental work, the U. S. Pharmacopœia, and as a result, standards of unexceptional value were established. It seems evident that the aim was to make the work as precise and thorough as possible, and this herculean task was indeed performed to the credit of the committee and the admiration of the pharmaceutical world at large. It might, therefore, had not new questions been interjected, be considered as insisting on a backward course, if the feasibility of maintaining the pharmacopœial standard is questioned. Still, in my surroundings at least, conditions have arisen which have developed the curious fact that the very precision and thoroughness of the Pharmacopœia may furnish a source of hardship to those whom it was intended to aid, on account of its being looked upon as the legal code by persons who are appointed to enforce laws regulating the purity of drugs. In my opinion, a vital oversight was, therefore made, in not qualifying a large number of these exacting descriptions, which in many cases, as I see the matter now, were from one side too precise and in others were applicable only to preparations at one point of their existence and at no other. Hence,

[1] Thanks are hereby extended to Dr. Sigmond Waldbott for detail assistance.
J. U. L.

the writer undertakes the responsibility of pointing in a general way to what may, under present conditions, be considered as defects and oversights, but which have not heretofore had an existence.

The substance under consideration may be divided into three classes, a few specimens of each being herein mentioned, and remarked upon as follows:

(1) It is evident that in many cases the intent was not to give standards that must be maintained in commerce, but to indicate what will be the condition of a substance when freshly and exactly prepared. As examples of substances that will illustrate this phase of the subject, I will call attention to Class A, to follow, embracing preparations that begin to change immediately and continue to alter with greater or less rapidity according to circumstances.

(2) Preparations in which the qualities demanded by the pharmacopœial descriptions are such as to render their production impractical or unnecessarily expensive, as shown by Class B, to follow.

(3) Substances used largely in the arts that the demands of commerce, necessities of manufacture or custom have established of qualities different from the standard of the U. S. P. In such cases, as shown by Class C, if no great advantage accrues from the pharmacopœial quality, it is questionable as to whether it is wise to demand a pharmacopœial strength different from that already established in commerce, or different from that established by the preceding Pharmacopœias.

CLASS A.

(1) *Liquor Sodæ Chloratæ* (Labarraque's Solution).

"An aqueous solution of several chlorine compounds of sodium, containing at least 2·6 per cent. by weight of available chlorine." —U. S. P., 1890.

A lot was prepared October 12, 1895, according to the direction of the U. S. P., kept well stoppered and protected from light; it was tested at different periods, with results as follows:

	Per Cent. Available Chlorine.
October 12, 1895	2·56
October 14, 1895	2·22
October 24, 1895	2·09
January 20, 1896	1·87
May 6, 1896	1·78

These results would indicate that the decrease in strength is not constant, but is most rapid at first, and that the preparation gradually approaches a state of equilibrium.

(2) *Liquor Plumbi Subacetatis* (Goulard's Extract).

"An aqueous liquid, containing in solution about 25 per cent. of lead sub-acetate (approximately $Pb_2O(C_2H_3O_2)_2 = 546{\cdot}48$)."—U. S. P., 1890.

A batch prepared as directed by the U. S. P., 1890, contained at different periods:

	Per Cent. Basic Salt.
April 17, 1895	25·19
September 26, 1895	23·40
February 10, 1896	23·04
May 7, 1896, sample	22·99
May 7, 1896, bulk	22·94

These results would suggest the same conclusion as drawn in the case of Labarraque's solution:

(3) *Acidum Sulphurosum* (Sulphurous Acid).

"A liquid composed of not less than 6·4 per cent., by weight, of sulphurous acid gas (SO_2) and not more than 93·6 per cent. of water."—U. S. P., 1890.

Two lots were examined:

	Per Cent. SO_2.
(A) One gallon, tested on December 10, 1895, showed	6·55
Same, tested on January 31, 1896, showed	6·38

The fluid had been placed in a stone jug, the latter securely stoppered with a paraffined cork, put into a cool place and had never been opened in the interim. The decrease in strength, amounting to 2·6 per cent. of the SO_2 originally present, cannot be due altogether to oxidation caused by air contained in the solution, for a simple calculation will demonstrate that were the solution saturated even with oxygen at 15° C., this amount could oxidize at most but 0·3 per cent. of the SO_2 originally present.

(B) A two-gallon lot in stone jug, closed securely by a cork. A small part of it was withdrawn on a purchase prior to March 5th. On March 8th, it was poured into three 5-pint glass-stoppered bottles, the stoppers having been previously dipped into melted paraffine, was tested immediately after filling, and again on May

15th, after 1 pint had been withdrawn from each under ordinary conditions.

The following table shows the decrease in strength under the manipulations described:

	Per Cent. SO_2.
Stone jug, February 3, 1896	6·67
May 5, 1896	6·08

	May 8th. Per Cent. SO_2.	May 15th. Per Cent. SO_2.
Bottle I.	5·92	5·62
" II.	5·89	5·57
" III.	5·80	5·62

These results will tend to show that notwithstanding the precautions directed, sulphurous acid, although originally slightly above the standard prescribed by the U. S. P., 1890, will, upon standing in vessels securely closed by corks, fall below thats tandard, and this decrease is accelerated by the dispensing of the preparation. In warm weather, the evolution of gas is very rapid and the pressure exerted will even throw out the cork.

(4) *Aqua Ammoniæ Fortior* (Stronger Ammonia Water.)

"An aqueous solution of ammonia ($NH_3 = 17{\cdot}01$), containing 28 per cent., by weight, of the gas."—U. S. P., 1890.

Three 1-pound samples in their original packages from different sources (*A* and *B*) were, in each case, freshly opened, and examined with results as follows:

	Per Cent. NH_3	Per Cent.
(A) January 31st, average	26·5	(26·7 and 26·3)
May 6th, average	25·54	(25·34, 25·71, 25·57)
(B) May 6th, average	26·61	

In the case of *B*, the original bottle was closed with a rubber stopper. In the case of *A*, it was closed with a cork stopper, protected by tinfoil.

The deviations from the U. S. P. standard, it is seen, are slight, but distinct, and undoubtedly unintentional.

(5) *Spiritus Ammoniæ.*

"An alcoholic solution of ammonia ($NH_3 = 17{\cdot}01$), containing 10 per cent., by weight, of the gas."—U. S. P., 1890.

Two quart specimens were examined. Both were contained in glass-stoppered bottles, the glass stoppers having been previously

dipped into melted paraffine. One pint was removed on a purchase on January 8th; the remainder was tested and kept as described.

		Per Cent. NH_3.
(Quart A)	On December 11, 1895, it contained	10·47
	On January 8, 1896, it contained	10·21
	On May 6th it assayed	9·50
(Quart B)	On December 11, 1895, it contained	10·47
	On May 6, 1896, it contained	9·56

These experiments would demonstrate that spirit of ammonia of the aforenamed strength, protected against evaporation as securely as before described, will gradually lose in strength, even though the bottle has not been opened (case *B*), and the use of paraffine in connection with glass stoppers does not offer sufficient or absolute safeguard against slow evaporation of the gas. Still, the amount that escaped was so small that there was not, at any time, a smell of ammonia noticeable around the stopper, nor could a cloudiness be seen when a drop of strong HCl was held near it.

(6) *Aqua Ammoniæ* (Ammonia Water.)

"An aqueous solution of ammonia ($NH_3 = 17{\cdot}01$), containing 10 per cent., by weight, of the gas."—U. S. P., 1890.

It was herein aimed to ascertain: (1) how much gas ammonia water will lose when insufficiently protected; (2) how much it will lose under the opposite conditions.

The percentage herein recorded refers to grammes of NH_3 in 100 c.c. of the fluid. One quart of ammonia water was operated upon.

	Per Cent. NH_3.
On May 17, 1895, its strength was	9·46
On May 21st, bottle covered with paper only	9·22
On May 24th, same	8·22

The specimen was now divided into two pints (*A* and *B*).

A was kept in a glass-stoppered bottle, sealed hermetically with paraffine. *B* was kept in a bottle loosely covered with a cork, which was simply laid over the mouth of the bottle.

	A. Per Cent. NH_3.	B. Per Cent. NH_3.
May 24, 1895	8·22	8·22
June 3, 1895	8·12	7·81
June 15, 1895	8·09	7·74
August 23, 1895	8·13*	6·65
May 6, 1896	7·84	4·83

* Evidently error of manipulation, which, unfortunately, was not corrected.

These results, in part, seem to confirm those obtained in the case of spirit of ammonia, inasmuch as the use of paraffine in connection with glass-stoppered bottles does not completely prevent the escape of ammonia. The loss is not so marked in this case, probably because the percentage (8·15 per cent. by volume) is lower than in the case of the spirit of ammonia, which was 10·47 per cent. by weight.

It will be observed that such substances as those herein enumerated, under class A, must necessarily deviate from the pharmacopœial standard. The question to be determined is what latitude should be permitted, a point upon which the writer has purposely aimed not to commit himself, as it would manifestly be out of place for him to do so. In the case of some members belonging to this class, *e. g.*, Labarraque's solution and Goulard's extract, the rate of deterioration as shown by these experiments is rapid at first, but decreasingly so thereafter, and yet other shop conditions might give different results. Spirit of nitrous ether is a conspicuous member of this class, but is not reported herein, as the writer hopes to make that substance the subject of a special paper for another occasion.

CLASS B.

A representative of this class of substances may be sufficient to cite:

Liquor Ferri Subsulphatis (Monsel's solution) and *Liquor Ferri Tersulphatis* (solution of ferric sulphate).

The direction given by the U. S. P. for making these preparations must be considered rather vague and indistinct if the finished product should conform to the tests which immediately follow them. For example, the boiling liquid may be "free from nitrous odor," and still not stand the test for the absence of nitric acid demanded subsequently.

These tests may be construed to demand the strict absence of both an excess of nitric acid and ferrous salt, a demand not easily complied with; for while it is an easy matter to entirely exclude either, leaving a slight excess of the other, it is impractical, to say the least, to exclude them both to that exactness which the wording of the tests of the U. S. P. implies. In our experience it has occurred that the liquid, holding in solution a slight yet perceptible excess of ferrous salt and a very slight excess of nitric acid, still showed reaction for both substances after prolonged boiling.

CLASS C.

(1) *Calx Chlorata* (Chlorinated Lime.)

"A compound containing not less than 35 per cent. of available chlorine."—U. S. P., 1890.

Two samples of commercial chlorinated lime (A and B) are reported as showing the probable variations in this substance:

	Available Chlorine.	
	Per Cent.	Per Cent.
(A) October 11, 1895, average	20·51	(20·45 and 20·57)
(B) May 8, 1896, average	31·47	(31·22 and 31·72)

While pharmacopœial chlorinated lime should seemingly be easily obtained, the writer has experienced difficulty in getting it of anything like a uniform quality, and probably this is the experience of others.

(2) *Calx Sulphurata* (Sulphurated Lime.)

"A mixture containing at least 60 per cent. of calcium monosulphide ($CaS = 71{\cdot}69$)."—U. S. P., 1890.

By applying the tests indicated in the U. S. P. to two samples from two different manufacturers, the following results were obtained:

A contained less than 30 per cent. of CaS.

B contained more than 30 per cent., but less than 45 per cent. of CaS.

In this direction it may be said that all attempts to obtain this preparation of pharmacopœial quality were ineffectual. Indeed, one authority stated that, owing to danger from spontaneous combustion, no effort would be made to produce it. The fact remains, the increase of the pharmacopœial requirements has not resulted in an increased valuation of the preparation.

(3) *Caustic Potash.*

"90 per cent. KOH."—U. S. P., 1890.[1]

Efforts were made to secure caustic potash which would meet the requirements of the U. S. P., and the following results were obtained:

---

[1] The U. S. P., 1890, gave no standard for caustic potash sticks. The present U. S. P. standard, established 1880, conforms also to the German Pharmacopœia, 3d edition.

	Per Cent. KOH.
October 1, 1895, fresh opened bottle, (a)	80·95
(b)	80·91
October 4, 1895, different sticks of another bottle	75·35
	77·98
	76·29
	77·24
December 9, 1895, new pound-bottles	74·96
	74·93
December 10, 1895, bulk, thick sticks	89·60
January 23, 1896, new lot, bulk, thinner sticks	86·02
	86·08
February 20, 1896, 10-pound can	82·74
February 24, 1896, sample	76·50

(4) *Caustic Soda.*—"90 per cent. NaOH."—U. S. P.

	Per Cent. NaOH
October 11th, from bulk, hard sticks	85·54
October 11th, same, soft surface	82·77
February 20th, pound bottles	91·8

These experiences will tend to show that manufacturers of such chemicals as caustic potash, find difficulties in supplying products which will meet the requirements of the U. S. P., or else do not wish to disturb the preparation demanded in trade, and are especially indifferent in cases such as chlorinated lime, where the standard given by the previous edition of the Pharmacopœia has been raised in the subsequent edition.

And still another class of variations should, in the opinion of the writer, be recognized, notwithstanding that in this direction many persons will assuredly differ. A certain liberal allowance should be made for deviations that result in the manipulation of simple pharmacopœial preparations. In the opinion of the writer, apothecaries should not be held to the exactness that follows the manipulation of expert analysts, or men who have every facility for precision. Even such preparations as tinctures, solutions, syrups and other preparations of a similar nature made by apothecaries should be permitted to vary within proper restrictions. The physician cannot prescribe these with any certainty when it comes to distinguishing between the effects of doses that vary in moderate amounts, and conditions exist in different drug stores that render it improbable in the mind of the writer that ordinary care can prevent marked variations from exact analytical standards.

Be it understood that no countenance is suggested herein for adulteration, sophistication, ignorance, or for carelessness of manipulation; only a plea is made for liberality towards those members of the pharmaceutical profession who aim conscientiously to do justice to their patrons, who use proper care in manipulations, but who cannot, and in the writer's opinion should not be asked to, meet too rigid requirements.

Conclusion.—In closing, the writer will state that he believes that while in behalf of the druggist a scale of reasonable variations should be affixed by the pharmacopœial committee to every pharmacopœial preparation, it is no less a matter of justice in behalf of those whose duty it is to enforce the food and drugs laws. These men should not be required to determine this question. To place this responsibility upon them is to establish as many different standards as there are officers, or else, if any so insist, to demand that these preparations be kept exactly according to the pharmacopœial standard, which means to require of apothecaries more than mortal man can accomplish.

A METHOD OF ASSAY FOR SANGUINARIA AND ITS PREPARATIONS.

By Charles H. LaWall.

The recent introduction of standardized drugs and their corresponding preparations has stimulated investigation along lines which are practically new, and the Pharmacopœia of twenty years hence will probably have a standard for each drug which contains some characteristic and therapeutically valuable constituent, together with the process of estimation best suited to the particular case at hand.

At the present time many investigators are devoting their time to this work, and scarcely a month passes but some new drug has a process proposed for the estimation of its active constituent (generally an alkaloid), together with the results obtained by the application of the process to a number of commercial samples of the drug for the purpose of fixing a standard.

Already many drugs have been studied in this manner, with the result that a number of manufacturers of pharmaceutical prepara-

tions have adopted standards for these drugs. These standards may not be absolutely correct as to the amount of alkaloid actually present; but certain it is that, when a drug assays a given per cent. of crude alkaloid by any process, and the fluid extract made from it, when assayed by the same process, contains the same percentage or slightly less, the drug has been thoroughly exhausted and thus a double check is kept upon work which formerly was far from uniform.

Sanguinaria is among those drugs which have had but little attention paid to them in this respect, and but one or two manufacturers standardize the preparations made from it.

Several of the general assay processes which are coming into such widespread use were applied to sanguinaria by the author of this paper, with the expectation of obtaining results which would permit the standardization of preparations made from it. The results were satisfactory for the purpose of standardization, which was the proximate object of the work, but while there were points of difference noticed between the alkaloidal constituents of the drug, no definite statement can be made as to the relations of these constituents as determined in the process used for assay.

The processes used in the experiments performed by the author were those based upon digestion of the ground drug, or its preparation, for a given length of time with certain solvents, in the presence of an excess of ammonia, subsequent separation of the alkaloid being effected by the use of immiscible solvents. The application of this process in general has been widely increased of late by the work of Messrs. Keller, Beckurts, Nagelvoort, Dohme, Kebler, Caspari, and others. No names will be applied to the processes hereafter described, but they will be designated by numbers instead.

The methods used were as follows:

No. 1.

Drug (No. 50 powder)	10	grammes.
Light chloroform ether[1]	100	"
Aqua ammoniæ	10	"

Macerate for four hours with frequent agitation; then add 5 grammes additional of aqua ammonia; shake well and separate the quantity required for assay.

---

[1] Light chloroform ether consists of 3 volumes ether and 1 volume of chloroform.

No. 2.

Drug (No. 50 powder)	10 grammes.
Ether	100 "
Aqua ammoniæ	10 "

The succeeding steps of this process are the same as in No. 1.

No. 3.

Drug (No. 50 powder)	10 grammes.
Prollius' fluid	100 c.c.

Lyons' General Assay Process No. 1, taken from *Pharmaceutical Assaying*.

No. 4.

Drug (No. 50 powder)	10 grammes.
Petroleum benzin	100 "
Aqua ammoniæ	10 "

Proceed same as No. 1 and No. 2.

The results obtained by these processes were as follows:

Process Used.	Solvent Used for Second Extraction.	Per Cent. of Alkaloid.	Color.
No. 1 . . .	Heavy chloroform ether[1]	4·86	White.
No. 2 . .	Ether	5·12	White.
No. 3 . . .	Heavy chloroform ether	6·06	Dark.
No. 4 . . .	Heavy chloroform ether	1·48	White.

[1] Heavy chloroform ether consists of chloroform 3 volumes and ether 1 volume.

The low results obtained in No. 4 were at first looked upon as being incorrect, but a repetition of the process afforded the same results.

A combination of processes Nos. 1 and 4 was then tried. This showed that the benzin exerted a solvent action upon only a portion of the alkaloid present, and gave constant results with the same sample; a subsequent extraction of the residue with light chloroform ether removed the remainder of the alkaloid, and gave results for total extraction agreeing within a small fraction of 1 per cent.

A sample of the ground drug was carefully assayed, using the benzin process, and contained 1·68 per cent. alkaloid. A fluid extract was then prepared from the same drug, using the process in

the United States Pharmacopœia for 1890. The fluid extract, when assayed by the same method, contained 1·67 per cent. alkaloid, thus proving that the process used in making the fluid extract had thoroughly exhausted the drug.

The alkaloid extracted by benzin was examined in comparison with that subsequently extracted by chloroform ether, with no definite results regarding their distinction.

Both melted at precisely 160° C.[1] when obtained in scales from the evaporation of an ethereal solution. Both showed a violet coloration with sulphuric acid and potassium bichromate, and showed a reddish purple fluorescence in ethereal solution. The hydrochloric acid salt of each was prepared, and was found to be of a bright red color, but no difference could be observed in their reactions.

The process, which had thus far been tried only upon the commercial drug, was then applied to some sanguinaria collected by the author on May 6, 1896, and dried at 60° C. to expel moisture, which amounted to 86·50 per cent. Assayed by the benzin process, it yielded 1·30 per cent. of alkaloid; this is slightly lower than in any sample of commercial drug examined, but may be due to the time of collection, which should be in autumn, according to the United States Pharmacopœia.

The same tests were applied to the alkaloids in this case, with similar results to those obtained previously.

A volumetric titration of the alkaloids was attempted, but was unsuccessful, owing to the deep red color of the salts of the alkaloid, which interfered with the accuracy of the indicator.

The following conclusions were drawn from the application of these processes to the drug and its preparations, working upon a practical scale:

(1) That the benzin process gives uniform results with any given

---

[1] The following melting points have been ascribed to these alkaloids by well-known authorities:

Sanguinarine, 211° C.; Chelerythrine, 203° C.; by G. König, 1891. *Chemische Centralhalle.*

Sanguinarine, 160° C.; Allen, *Com'l Org. Anal.*, Vol. III, part II.

Sanguinarine, 160° C.; H Nasehold; *J. Prakt. Chem.*, cvi, 385.

Sanguinarine, 213° C.; *Ladenburg Handwörterbuch.*

sample of the drug and the preparations made from it, and may be used for standardization.

(2) That 1·50 per cent. may be considered as the average alkaloidal content of the commercial drug by the benzin process.

305 CHERRY STREET, PHILADELPHIA.

RECENT LITERATURE ON THE SOJA BEAN.

BY HENRY TRIMBLE.

The immediate excuse for the appearance of this paper is the fact that a number of contributions have recently appeared on the soja bean, notably from the College of Agriculture, Imperial University of Japan. Soja hispida, Mœnch (Glycine hispida, Maximowicz), is an annual leguminous plant of India, China and Japan, where the bean and its products constitute an important proportion of the food of the populace. Wherever rice forms the principal food for man, as in Japan and China, an addition of some other food richer in proteids is necessary, in order to make up the deficiency in the rice. The inhabitants of these countries near the seacoast supply this want by the use of marine animals, while the inland people subsist on the seeds of various leguminous plants, especially the soja bean. Beef and other kinds of meat have only come into use in recent times. The following analyses indicate the reasons for the popularity of the soja bean in countries where nitrogenous food is in demand :

	1.	2.	3.	4.	5.
Crude protein	38·69	31·21	34·92	33·36	42·05
Fat	17·87	18·29	15·53	21·89	20·46
Crude fibre	12·69	12·78	12·81	—	4·53
Starch	3·49	3·51	3·53	—	—
Ash	5·39	5·63	5·97	5·35	4·19
Other organic matters	21·01	28·09	26·53	34·18	28·82

Sample No. 1 was from China, No. 2 from Hungary, No. 3 from France, and all were analyzed by Pellet (*Compt. rend.*, **90**, 1077); No. 4 was analyzed by Güssmann (*Chem. Centralb.*, 1890, p. 133); and No. 5 was from Japan, analyzed by O. Kellner (*Bulletin Imperial College of Agriculture*, Vol. 1, No. 2). The most important food constituent is the protein, but what is of still more interest to pharmacists is the presence of an active diastatic enzyme, said by

Stingl and Morawski (*Chem. Centralb.*, 1886, p. 724) to be present in the soja bean to a greater extent than in many other leguminous seeds.

This ferment is said to have a powerful action upon starch, two-thirds of which it converts into sugar, and one-third into dextrin.

Güssmann has determined that 90 per cent. of the soja protein, 89·8 per cent. of the fat, and 14·5 per cent. of the crude fibre are digestible.

According to E. Schulze (*Zeit. Physiolog. Chemie.*, **12,** 405), etiolated soja shoots contain as much as 7 to 8 per cent. of asparagine, as well as leucine, phenylamidopropionic acid, choline, and bases of the hypoxanthine groups, whilst the presence of arginine is uncertain. In this latter point the soja shoots differ from those of the lupines, which contain plenty of the arginine.

The oil may be extracted by pressure or by means of solvents; it is said to possess some laxative properties, is of a yellowish brown color, and has a slightly aromatic odor; it is intermediate between the drying and non-drying oils. The following properties are given by Stingl and Morawski (*Chem. Zeit.*, 1886, p. 140):

Specific gravity at 15°	0·924
Point of solidification	8° to 15°
Fusing point of fatty acids	27° to 29°
Point of solidification of fatty acids	23° to 25°
Temperature rise	59°
Iodine number,	121·3
Iodine number of fatty acids	122·0
Saponification number	192·5

The starch found by Pellet and Güssmann was not found by Kellner, and this absence has been more recently confirmed by Inoyue (*Bull. Imp. Coll. Agriculture*, Vol. 2, No. 4); this freedom from starch has repeatedly led to the suggestion that soja meal be used in making bread for diabetics.

Levallois (*Compt. rend.*, **93,** 281) found a sugar in soja bean which, on precipitation by ether from its alcoholic solution, forms a very deliquescent mass; it does not reduce Fehling's solution, ferments readily with yeast, and is converted by oxidation with nitric acid into mucic and oxalic acids.

The thrifty Japanese have not been slow in availing themselves of a food so readily cultivated and so rich in proteids as to form a valuable adjunct to their rice. The drawbacks of the soja bean are

its indigestibility, and, when dry, slow yielding to the cooking process. In order to overcome these difficulties, there have been prepared in Japan since the remote times when the soja bean was first used, at least three products, *miso*, *natto* and *tofu*, in the manufacture of which the aim is to produce an easily digestible and nutritious food.

The first of these, *miso*, as described by Kellner (*Bulletin of the Imperial College of Agriculture*, Vol. I, No. 6, and *Chem. Zeit.*, **19**, 97, 120 and 265), is made on a large scale in special factories and on a small scale in private families. The first step in this preparation is the manufacture of *koji*, a diastatic ferment, from rice or barley. The rice is steamed until the form of the grain is not quite destroyed or the starch cells fully burst. It is then spread on straw mats and allowed to cool to 28° C. Spores of the mould Aspergillus oryzae are then mixed with the rice and the mass placed in a room at 20° C. for twenty-four hours, during which time the temperature rises to 40° C. It is then divided into small portions and placed in a warm part of the cellar for twelve to twenty-four hours, when it is well kneaded and allowed to cool; the latter is hastened by the addition of cold water, if necessary. In about three days from the steaming of the grain, the process is completed and the rice is permeated with a fine mycelium; the product is *koji*. The *miso* is then made by taking 5 parts of soja beans, 3 to 6 parts of rice or barley *koji*, 1½ to 2 parts salt and 1 part water. The beans are steamed and broken up, mixed with salt and water and the *koji* added to the cooled mixture. The procedure then depends somewhat upon whether the *miso* is needed soon or not. The temperature regulates the rapidity of the process, and if there is no particular haste required, it is maintained as low as possible. The finished product is a stiff, brownish-red porridge, of a variable composition, containing as much as 50 per cent. of water, 1 per cent. of alcohol and some free acid. There are at least four varieties of *miso*, varying in the time required in their manufacture from three or four days to one and one-half years.

Natto is prepared by boiling the beans in water for four or five hours, until they are perfectly soft. The mass, while still hot, is wrapped in straw, and the bundles thus formed, when well tied at both ends, are placed in a cellar, in the middle of which a fire is kindled, whereupon the cellar is well closed. The heat is left to act

for twenty-four hours, after which the product is ready for consumption. Although the moderate heat of the cellar acts for only twenty-four hours, still there is considerable bacterial growth going on. The product has a peculiar, but not putrid odor. K. Yabe (*Bulletin of Imp. College of Agriculture*, Vol. 2, No. 2) found in this substance four kinds of microbes present, and he believes the chemical decomposition of the proteids to be due to one or more of these microbes. In Japan this *natto* is regarded as a vegetable cheese. A chemical investigation by the author just mentioned revealed tyrosin, peptone, guanine, leucin and xanthine. The total proteids amounted to considerably more in the *natto*, when allowance was made for increase of moisture, than existed in the original bean, and the artificial product is also considered to be much more digestible.

A still more interesting preparation of the soja bean than either of the preceding is *tofu*. This has been described and investigated by M. Inouye (*Bulletin Imp. College of Agriculture*, Vol. 2, No. 4). The beans are first soaked for about twelve hours in water, and then crushed between two millstones until a uniform pulpy mass is obtained. This is then boiled with about three times its weight of water, and filtered through cloth. The liquid filtrate is white and opaque, very closely resembling cow's milk, while the odor and taste remind one of fresh malt. On standing, the liquid becomes sour from the formation of lactic acid, and a coagulation of the casein takes place. The freshly boiled and filtered liquid is coagulated either by the addition of a portion of the sour liquid which has been set aside from a previous lot, or it is treated with about 2 per cent. of a concentrated brine, such as is obtained as mother liquor from the preparation of sea salt. In either case, the addition of the precipitant causes the separation of a flocculent substance, which soon coagulates, and is collected on a cloth filter, slowly pressed, and then cut into tabular pieces of about 150 grammes each. These, when dipped in a mixture of turmeric and brine, are ready for consumption. Only about one-fourth of the total amount of the proteids in the original beans is recovered in the *tofu*. This vegetable casein is not precipitated from the milky liquid by the sodium chloride of the brine, but by the magnesium and calcium chlorides. Calcium nitrate or magnesium sulphate will produce the same result, although an excess of the latter must be avoided or the pre-

cipitate would re-dissolve. *Tofu* is manufactured only on a small scale, by people who sell it in their own shops.

Kori-dofu is another form of *tofu*, made by exposing the tablets of the latter to the action of frost, whereby they shrink considerably, lose water and become more compact. The Chinese preparation, *tao-hu*, is similar to, or, perhaps, identical with, *tofu*. Several other preparations of soja bean are known in India, China and Japan, most of them prepared, no doubt, with the object of making them more digestible. The celebrated *shoyu* or *soy*, a bean sauce, is a product said to be made from soja bean, although it is probable that the small variety, Phaseolus radiatus, is used for this purpose.

Somewhere about the year 1888 the soja bean was introduced into the United States. It has been tried in a number of State Experiment Stations, and is gradually working into favor in the Southern States. In Kansas the plant has been found to withstand considerable drought. The beans are planted in drills, 2½ to 3 feet apart, and 1½ to 2 inches apart in the rows. The plant attains a height of 3 to 4½ feet, and bears the short pods thickly on the bushy plants. As soon as the beans commence to ripen, the plants are cut by mowing, and then threshed. The plant is valuable for forage or soiling. The beans have been produced in South Carolina to the amount of 10 to 15 bushels per acre. On account of their richness in oil they have been used as a substitute for cotton-seed meal in feeding cattle, with very satisfactory results.

The plant is believed to have; in common with most cultivated leguminosæ, the power of obtaining some of its nitrogen from the air, and hence, of acting as a soil renovator.

THE TANNINS OF SOME ERICACEÆ.

By Bertha L. DeGraffe, Ph.G.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy. No. 154.

It is a well-known fact that the natural order Cupuliferæ affords both of the kinds of tannin which are now conceded to exist. This classification of the numerous tannins is derived from the reasons that the qualitative reactions of the known tannins agree in the main with one or the other of two quite constant series of behaviors; that among their decomposition products but two classes of well-

defined compounds have been found; and that, for substances so difficult to isolate and purify, the percentage compositions indicated by ultimate analysis are sufficiently near to one or the other of two general molecular formulas as to make their agreement with one of these almost imperative.

But these principles have been classified with respect to other properties, even to the part they are supposed to play in the economy of plants. They are, therefore, often spoken of as pathological and physiological, the qualifying names which Wagner[1] applied in 1866 to the two divisions of his classification of the then known tannins according to the conditions under which they seemed to be present in the plant. The former term was intended to designate those tannins found on vegetable tissues, which had been injured by the sting of an insect, while to the latter division was assigned the great number of tannins present in normal or uninjured vegetable tissues. To exemplify these classes, the well-known gallotannic acid which is obtained from galls—the excrescences on the twigs and leaves of Quercus lusitanica, caused by the punctures and deposited ova of Cynips Gallæ tinctoriæ—was proposed for the one, and the tannin of oak bark, whose detection as a definite principle had been made 100 years before, offered for the other. But although these terms, pathological and physiological, have been used to distinguish two classes of tannins, investigation has not shown that the occurrence of gallotannic acid in vegetable tissue is in all cases under a pathological condition, for in some plants it has been proven to be the only tannin therein existing, and for this indisputable reason it must be looked upon as a physiological tannin. So it is now agreed that some of the tannins which occur in uninjured or normal vegetable tissue are identical with gallotannic acid. Notable among those which have been found to possess the same composition as gallotannic acid, and on that account have come into conflict with the proposed definitions of Wagner, are the tannins of sumac, chestnut wood and bark, pomegranate bark and cloves. Some observations of the most prominent members of the natural order Ericaceæ, which yield tannin-bearing medicinal drugs, led the author to believe this order to be a promising field for the investigation of the possible

---

[1] Beiträge zur Kenntniss und zur quantitativen Bestimmung der Gerbsäuren. *Zeit. anal. Chem.*, 5, 1.

occurrence of both kinds of tannin in the normal tissues of a single order, and to investigate this point the work discussed in this paper was undertaken. The most important of the drugs which this family of plants supplies were selected because of the interest attached to them in pharmacy and medicine. The official drugs uva ursi and chimaphila were investigated, and besides these, the leaves of gaultheria and of manzanita, the stems and leaves of mountain laurel, and the entire plant of trailing arbutus were examined in like manner. The origin of the drugs may be thus expressed:

Drug.	Origin.	Sub-Order.
Uva Ursi,	Arctostaphylos uva ursi,	Arbuteæ.
Gaultheria,	Gaultheria procumbens,	Andromedeæ.
Chimaphila,	Chimaphila umbellata,	Pyroleæ.
Manzanita,	Arctostaphylos glauca,	Arbuteæ.
Mountain laurel,	Kalmia latifolia,	Rhodoreæ.
Trailing arbutus,	Epigæa repens,	Ericineæ.

The uva ursi, manzanita and chimaphila were purchased in the drug market, and were, of course, in an air-dried condition, while the other drugs were of recent collection. These were allowed to become air-dried and were then ground. The method of extracting the tannin from the materials consisted in percolating the latter with acetone. The solvent was recovered from the percolate and the resulting semi-solid extracted matter was treated with water. Through this mixture paper pulp was suspended, and, after thorough agitation, these materials were poured upon a plug of cotton in a funnel. The filtrate which was obtained was then shaken with successive portions of acetic ether, as long as this solvent continued to remove tannin from the aqueous liquid. The different portions of acetic ether so applied were united, and the entire volume distilled under diminished pressure on a water-bath to dryness. To further purify the residues gotten by this means, they were treated with water, as were the semi-solid extracted matters from which they had been obtained. Paper pulp was likewise distributed through these solutions, and the resulting mixtures were poured upon cotton, as before. This treatment served to separate more of the resinous and other non-tannin substances, for, in all cases, the residues of tannin which were left upon recovering the acetic ether (by means of which they had been extracted from the aqueous liquids) showed a greater degree of purity than that possessed by

the first residues had in this manner. Repetitions of this treatment with water in the presence of paper pulp, and subsequent removal of the tannin from the water solution, were made with each of the tannins until no further change could be effected by its agency. When this repetitious treatment with water no longer caused a separation of non-tannin materials from the principles under consideration, these compounds were obtained in a porous or "puffed-up" condition upon the last recovery of the acetic ether. The tannins from this process of purification were of light reddish tinge in the cases of trailing arbutus, gaultheria and mountain laurel, while those from uva ursi, manzanita and chimaphila were of straw-yellow color.

In order to still further free the principles from closely associated resinous impurities, and also from acetous odors, they were thoroughly dried at 120° C., and, after allowing them to cool, treated with absolute ether. Besides this treatment, and prior to it, it was found necessary, in the cases of manzanita and chimaphila, to agitate the aqueous solutions of the tannin with ether—a method which was found to be more efficient for the separation of resinous substances than was the application of absolute ether to the completely dried substance. The drying of the tannins caused the development of a reddish-brown color in the principles from gaultheria, trailing arbutus and mountain laurel. This feature at once suggested their similarity to oak bark tannin, which assumes a red color under the same influence. The tannins from the several drugs, after having been purified by the above measures as far as it was found possible, were subjected to the following investigations, for the purpose of deciding their chemical characters and effecting their classification.

For the purpose of comparing the qualitative reactions of the several tannins with the known behaviors of typical representatives of the two classes of these principles now recognized, a 1 per cent. solution of each was tested with the reagents mentioned in the accompanying chart.

While the reactions obtained in the qualitative examination did not agree as closely as might be desired with those given by gall tannin or oak bark tannin, still, the general tendency of the reactions of the principles from manzanita and uva ursi was to resemble those of gall tannin, and the behavior of those from trailing arbutus, gaultheria, chimaphila and mountain laurel to resemble the reactions of

Reagent.	Chimaphila.	Acid.	White Oak Bark Tannin.
Copper Sulphate	Yellowish ppt.		Ppt.
and Ammonium hydrate	Slight ppt. and green color.		Brownish-green color.
Pine wood shaving and Hydrochloric acid .	No change.	color.	Violet color.
Nitrous acid	Brown ppt.		Brown ppt.
Bromine water	Yellow ppt.		Yellow ppt.
Ferric chloride	Brownish-green ppt	ad ppt.	Green color and ppt.
and Ammonium hydrate	Brown ppt.		Purple-brown ppt.
Ammonio-ferric sulphate	Brown ppt.	ıd ppt.	Green color and ppt.
Calcium hydrate . . .	Ppt. changing to pink on top.	blue.	Ppt. turning pink.
Lead acetate	Yellow ppt.		Yellowish ppt.
Potassium bichromate	Brown ppt. upon standing.		Brown ppt.
Uranium acetate . . .	Crimson color changing to brown ppt.	or and	Crimson color and brown ppt.
Ferric acetate	Olive-brown ppt.	nd ppt.	Green color and ppt.
Gelatin	White ppt.		White ppt.

oak bark tannin. A further investigation of the chemical natures of the tannins through their decomposition products was then decided upon, so for this purpose the effects of several methods of decomposition were tried. These methods included fusion of the tannins with caustic alkali, boiling with hydrochloric acid, and the application of sufficient heat to alter their chemical constitutions; they were conducted as follows:

Fusion with Caustic Alkali.—Some of the tannin was added to potassium hydrate, which had been liquefied by heat. The mixture was thoroughly stirred and the heat continued for twenty minutes, after which time the fusing substances were allowed to become cold. The solid cold mass was dissolved in water, the resulting solution slightly acidified with dilute sulphuric acid, the unfiltered mixture shaken with ether and the solvent separated and allowed to evaporate spontaneously. Residues of a more or less reddish-brown color were obtained in all cases. These residues were dissolved in water and tested qualitatively, as indicated by the following chart:

	Potassium Cyanide.	Ferric Chloride and Sodium Carbonate.	Ferrous Sulphate.	Lead Acetate.	Pine Wood and Hydrochloric Acid.
Chimaphila	No change.	Red color, reddish yellow ppt.	Reddish color.	Yellowish ppt.	No change.
Trailing arbutus . .	No change.	Green ppt., red color.	Green color.	Yellowish ppt.	No change.
Gaultheria	Olive green color.	Green ppt., red color.	Green color.	Brownish ppt.	Red color.
Mountain laurel . .	Olive green color.	Green ppt., red color.	Green color.	Brownish-yellow ppt.	Red color.
Manzanita	No change.	No change, reddish-yellow color.	Slight green color.	Yellowish ppt.	No change.
Uva Ursi	Reddish color.	Green ppt., reddish color.	Plum color.	Brownish yellow ppt.	No change.
Protocatechuic acid	—	Bluish-green color, red color.	Violet color.	White ppt.	—
Gallic acid	Red color.	Deep blue ppt.	No reaction.	White ppt.	—

Action of Acids.—To effect the decomposition of the tannins by this means, a quantity of each sample was added to boiling hydrochloric acid which contained 2 per cent. of absolute gas. All of the samples dissolved in this liquid. As the boiling progressed, the liquids to which the tannins from chimaphila, manzanita, and uva

Reagent.	Chimaphila.	Trailing Arbutus.	Gaultheria.	Mountain Laurel.	Manzanita.	Uva Ursi.	Gallotannic Acid.	White Oak Bark Tannin.
Copper Sulphate and	Yellowish ppt.	Yellowish ppt.	Slight ppt.	Brownish ppt.	Brownish-yellow ppt	Yellowish ppt.	No ppt.	Ppt
Ammonium hydrate	Slight ppt. and green color.	Dark green ppt.	Slight ppt.	Greenish-brown ppt.	Greenish-brown ppt.	Dark green ppt.	Brown ppt.	Brownish-green color.
Pine wood shaving and Hydrochloric acid	No change.	Violet color.	Violet color.	Violet color.	Violet color.	No change.	Slight green color.	Violet color
Nitrous acid . . .	Brown ppt.	Brown ppt.	Brown ppt.	Brown ppt.	Brown ppt.	Brown color.	Brown ppt.	Brown ppt.
Bromine water	Yellow ppt.	Yellow ppt.	Yellow ppt.	Yellow ppt.	Brownish-yellow ppt.	No ppt.	No ppt.	Yellow ppt.
Ferric chloride and	Brownish green ppt.	Brownish-green ppt and color.	Green ppt. and color.	Brown ppt.	Brown ppt.	Slate-colored ppt	Blue color and ppt.	Green color and ppt
Ammonium hydrate	Brown ppt.	Brownish black ppt	Purplish red ppt. and color.	Brown ppt.	Brown ppt.	Maroon ppt.	Purple ppt.	Purple brown ppt.
Ammonio-ferric sulphate	Brown ppt.	Dark slate ppt.	Olive-brown ppt.	Brown ppt.	Olive-brown ppt.	Blue ppt.	Blue color and ppt.	Green color and ppt
Calcium hydrate . .	Ppt. changing to pink on top.	Ppt. changing to pink on top.	Ppt. changing to pink on top.	Ppt changing to pink on top.	Ppt. changing to pink on top.	White ppt., liquid becoming blue.	Ppt. turning blue.	Ppt. turning pink.
Lead acetate	Yellow ppt.	Yellow ppt.	Yellow ppt.	Orange-yellow ppt.	Brownish-yellow ppt	Yellow ppt.	White ppt.	Yellowish ppt.
Potassium bichromate	Brown ppt. upon standing.	Brown ppt.	Reddish-brown ppt.	Orange-yellow ppt.	Brown ppt.	Brownish-yellow ppt	Brown ppt.	Brown ppt.
Uranium acetate . . .	Crimson color changing to brown ppt	Crimson color and brown ppt.	Crimson color changing to brown ppt.	Crimson color and brown ppt.	Crimson color changing to brown ppt.	Crimson color changing to brown ppt.	Crimson color and brown ppt.	Crimson color and brown ppt
Ferric acetate . . .	Olive-brown ppt.	Dark slate ppt	Brownish-green ppt	—	Brownish green ppt.	Green ppt.	Blue color and ppt.	Green color and ppt
Gelatin . . .	White ppt	Flesh-colored ppt.	Pinkish ppt	Yellow ppt.	Flesh-colored ppt.	White ppt.	White ppt.	White ppt

ursi had been added acquired yellow colors, while those in which the tannins of trailing arbutus, gaultheria, and mountain laurel had been dissolved, developed red colors. When the liquids had attained the boiling point those representing the tannins of chimaphila, manzanita and uva ursi commenced to deposit brownish precipitates, while red deposits separated from the solutions corresponding to the principles from trailing arbutus, gaultheria and mountain laurel. These solutions were boiled for two hours, and then allowed to cool. The insoluble substances which had separated were then filtered off. They were washed with cold water and then allowed to dry in the air. They were next treated with hot water, which showed a solvent action on all of them. The solutions obtained by the use of hot water gave the following reactions:

Reagent.	Chimaphila.	Trailing Arbutus.	Gaultheria.	Mountain Laurel.	Manzanita.	Uva Ursi.
Ferric chloride and odium carbonate	Reddish-yellow color.	Olive-brown color.	Plum color.	Olive-brown ppt.	Olive-brown ppt.	Bluish color, green ppt.
	Brown ppt.	Deep brown ppt.	Brown ppt.	Blackish-brown color.	Dark brown ppt.	Brown ppt.
otassium cyanide .	Red color.	Deep red color.	Dark red color.	Greenish-yellow color.	Reddish yellow color.	Yellowish color.

Some of that part of the insoluble product from the action of the 2 per cent. hydrochloric acid, which was undissolved by the hot water, was thereafter treated with alcohol, which dissolved all of them completely. The alcoholic solutions so obtained gave these reactions with ferric chloride:

Chimaphila.	Trailing Arbutus.	Gaultheria.	Mountain Laurel.	Manzanita.	Uva Ursi.
Brownish-red color.	Green color and ppt.	Green color and ppt.	Plum color and ppt.	Green color and ppt.	All dissolved in hot water.

The remainders of the insoluble portions were treated with potassium hydrate solution, which also readily dissolved the substances with the production of colored solutions. All of these solutions, when made acid with acetic acid, deposited precipitates resembling in appearance the substances which had been dissolved. The acid

liquids, which were filtered from the insoluble substances deposited during the treatment with hot hydrochloric acid, were shaken with ether in order to remove any decomposition products which might be present. The several portions of ether, which were employed for this purpose, were mixed, the excess recovered by distillation, and the remainder allowed to evaporate spontaneously. Upon the evaporation of the ether, there was left, from each of the tannins, a residue which was soluble in water. The following table shows the reactions given by the water solutions of these residues:

Product from Tannin of	Potassium Cyanide.	Ferric Chloride and Sodium Carbonate.	Ferrous Sulphate.	Lead Acetate.	Pine Wood and Hydrochloric Acid.
Chimaphila	Red color, fading.	Green ppt., red color.	Chocolate brown ppt.	Yellowish ppt.	No change.
Trailing arbutus	Red color.	Dark green ppt., red color.	Greenish-brown ppt.	Yellowish ppt.	Red color.
Gaultheria	Red color.	Light green ppt., red color.	Blue ppt.	Yellowish ppt.	No change.
Mountain laurel	Red color.	Green ppt., red color.	Green color.	Yellowish ppt.	No change.
Manzanita	Red color.	Brown ppt., red-brown ppt.	Brown ppt.	Yellowish ppt.	Slight red color.
Uva Ursi	Red color, fading.	Green color and ppt., deep claret color.	Greenish color.	Yellowish ppt.	No change.
Protocatechuic acid	—	Bluish-green color, red color.	Violet color.	White ppt.	—
Gallic acid	Red color.	Deep blue ppt.	No reaction.	White ppt.	—

Action of Heat.—To obtain the decomposition products which result from the heating of the tannins to such an extent that their chemical compositions are altered, a portion of the principle from each of the plants was stirred into a few cubic centimetres of glycerin and the resulting mixture heated to 180° C., for about half an hour. The temperature was then raised to 190° C., at which point it was maintained for ten minutes. The mixtures were allowed to become cold, and were subsequently dissolved in water. The water solutions were shaken with successive portions of ether, which were separated and allowed to evaporate spontaneously. The residues which were thus obtained were dissolved in water and submitted to the reactions expressed in the following chart:

Product from Tannin of	Calcium Hydrate.	Ferric Chloride.	Ferric Acetate.	Ferrous Sulphate.
Chimaphila	Slight reddening.	Green ppt.	Slight green ppt.	Greenish ppt.
Trailing arbutus	Brownish ppt.	Green ppt.	Green ppt.	Plum ppt.
Gaultheria	Red ppt. and color.	Green ppt.	Green ppt.	Plum ppt.
Mountain laurel	Slight red color.	Plum ppt.	Plum ppt.	Greenish ppt.
Manzanita	Greenish-yellow ppt.	Olive-brown ppt.	Olive-brown ppt.	Plum ppt.
Uva Ursi	No change.	Olive-brown ppt.	Olive-brown ppt.	Plum ppt.
Pyrogallol	Purple color, changing to brown.	Red color, changing to brown.	—	Blue color, changing to green and red.
Catechol	Reddish or brown ppt.	Green color.	—	No reaction.

The foregoing chemical investigations not having given as definite knowledge of the exact nature of the tannins as the author desired, a quantity of the principle from each of the drugs was submitted to combustion in order to determine the ultimate composition of the substances as the last recourse in the attempt to classify them. The combustions were performed with copper oxide, in an open tube through which a stream of oxygen was conducted. The results were calculated into percentages, in the usual way; they were as follows:

	Trailing Arbutus.	Gaultheria.	Mountain Laurel.	Oak Bark.
Carbon	59·26	59·73	61·00	59·79
Hydrogen	4·88	4·87	5·33	5·08
Oxygen	35·86	35·40	33·67	35·13

	Uva Ursi.	Manzanita.	Gallotannic Acid.
Carbon	52·88	54·71	52·17
Hydrogen	4·26	4·44	3·10
Oxygen	42·86	40·85	44·73

	Chimaphila.		
	I.	II.	III.
Carbon	57·54	58·22	57·82
Hydrogen	5·69	5·58	5·45
Oxygen	36·77	36·20	36·73

The average percentage composition of the tannins from the barks of nine species of oak, as given on page 93 of Volume II of "The Tannins," by Henry Trimble, as also the percentage composi-

tion of gallotannic acid, are here added for comparison with the amounts of the three constituent elements indicated by the combustions of the tannins of the six Ericaceæ.

The insight into the compositions of the principles, which the ultimate analyses afforded, undoubtedly indicates that the tannins obtained from trailing arbutus, gaultheria and mountain laurel have the same centesimal composition as that class of these compounds of which oak bark tannin is the most common representative; and that the tannins from manzanita and uva ursi contain the same proportions of carbon, hydrogen and oxygen as does gallotannic acid.

It will be seen that the results obtained for the tannin of chimaphila do not closely agree with the percentage composition of either class. This tannin was particularly difficult to purify. Two different lots of the drug were extracted for its tannin with the same success, for, even after repeated purifications, the results of combustion were found to be constant, as is shown above. But these combustion figures certainly indicate greater resemblance to the oak bark tannins than to gallotannic acid, as also did the general chemical behaviors of the tannin in the processes of decomposition and the characters of the products so obtained.

In conclusion, it seems justifiable to believe that sufficient evidence has been presented to prove the existence of the two kinds of tannin in the uninjured or normal tissues of a single order, a fact which substantiates the idea that either kind of tannin may be physiological.

A CONTRIBUTION TO THE KNOWLEDGE OF SOME NORTH AMERICAN CONIFERÆ.

BY EDSON S. BASTIN AND HENRY TRIMBLE.

(*Continued from page 254.*)

PINUS RESINOSA, AITON.

RED PINE—NORWAY PINE.

GENERAL CHARACTERS.

This is a tree with a straight bole, attaining a diameter of about 2 feet at the base, and a height of from 75 to 150 feet. It has a rather regularly and distantly fissured bark, which is, between the fissures, smoother than in most of the other species, and of a red color, whence the common name, red pine. The cones are terminal,

conic-ovate, about 2 inches long and with but slightly thickened, pointless scales. The leaves are 5 or 6 inches long, in twos, from long sheaths, convex on one side and flat on the other, the former with from eight to twelve rows of stomata, and the latter with from seven to ten rows. Hypoderma often only one-layered or two-layered only in places; the single layer, or where doubled, the outer one, composed of cells which are only moderately thick-walled, while the cells of the inner layer are excessively thick-walled.

Secretion reservoirs numerous, from nine to twelve, located next the hypoderma, and each is bounded by a layer of thick-walled

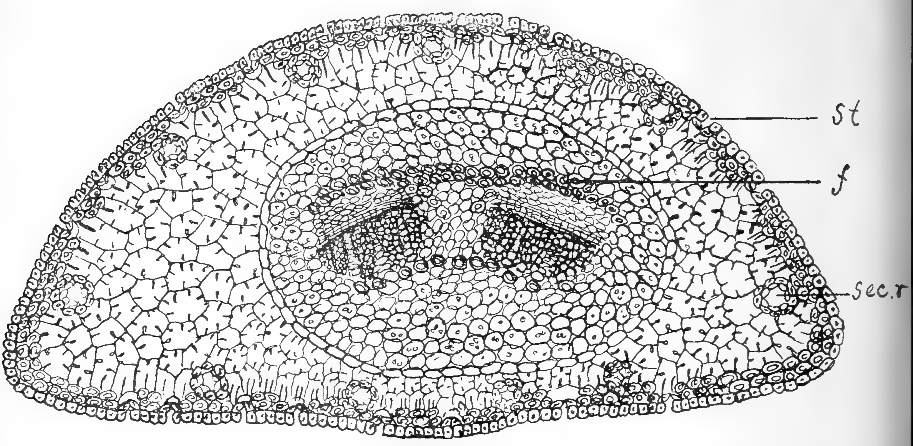


Fig. 28, cross-section of leaf of Pinus resinosa, magnified about 100 diameters. *St*, stoma; *f*, band of fibrous tissue forming the outer boundary of the bast; *sec. r.*, secretion reservoir.

cells. The fibro-vascular bundles are each crossed by three or four medullary rays. A band of thick-walled fibres in about two rows bounds the bast on its exterior and extends across the interval between the bundles. There are usually also a few thick-walled fibres forming an interrupted row opposite the xylem ends of the bundles.

MICROSCOPICAL STRUCTURE.

A cross-section of a branch of two years' growth showed the following structure: Externally, an epidermis, in places ruptured, composed of small, but excessively thick-walled cells; beneath this two or three layers of thin-walled parenchyma, interior to which was

a periderm, composed at its outside of stone cells, in one or two layers, and interiorly of thin-walled cells, including a cork cambium, all rich in tannic matters. Interior to the periderm layer was a considerable thickness of parenchyma, composed mostly of large, tangentially elongated cells, a large proportion of which contained

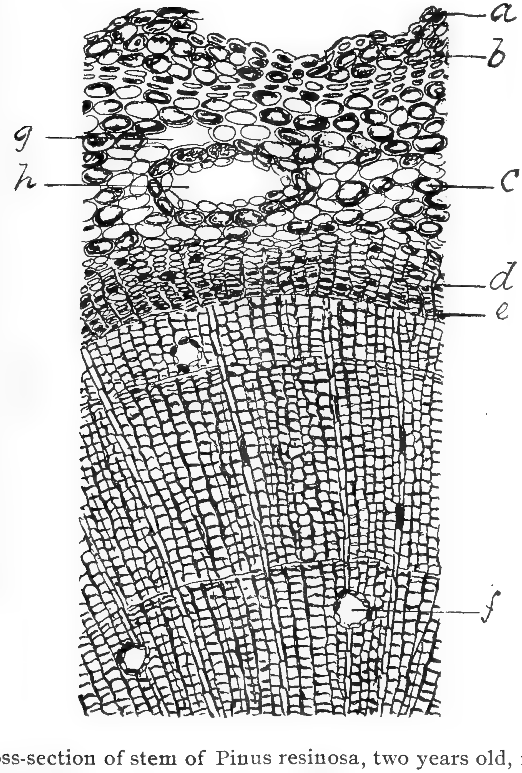


Fig. 29, cross-section of stem of Pinus resinosa, two years old, magnified 100 diameters. *A*, epidermis; *b*, thick-walled periderm cells; *c*, tannin cell; *d*, bast layer; *e*, cambium; *f*, secretion reservoir in xylem; *g*, lacuna; *h*, secretion reservoir in bark. Drawing from specimen that had been treated with anhydrous ferric chloride, dissolved in absolute alcohol, for the purpose of showing the distribution of tannin.

tannin. The secretion reservoirs found in this area were similar in character to those already described in other species.

In the xylem the secretion reservoirs were observed to be disposed more or less evidently in circles.

Tannic matters appeared to be distributed very much as in the

species already described, abounding in the middle and inner layers of the bark, in the pith, and occurring in many of the medullary ray cells of the xylem and in the secreting cells bounding the secretion reservoirs.

The secretion reservoirs appeared to be not less abundant than in some of the more resinous species, but the oleoresinous matters were more localized in the secretion reservoirs and the cells immediately surrounding them, and less diffused through other tissues than in P. palustris, for example.

OCCURRENCE.

This tree has a northerly range, occurring in Canada and in the northern United States from Maine to Minnesota. It has a compact, hard, not very resinous wood, which is durable and much prized for lumber.

CHEMICAL COMPOSITION.

The composition of Pinus resinosa has been investigated so far as to determine the percentages of tannin and mineral constituents in the leaves, stem bark and root bark, with the following results:

	Moisture.	Ash in absolutely dry substance.	Tannin in absolutely dry substance.
Leaves	7·71	2·28	2·60
Stem bark	9·73	2·65	12·67
Root bark	10·77	2·67	8·40

The ash of the leaves consisted of potassium, calcium, magnesium, combined with phosphoric, sulphuric and very little carbonic acid.

The ash of the stem bark consisted of potassium and calcium carbonates, phosphates and sulphates.

The ash of the root bark was found to be composed of potassium and calcium phosphates, sulphates and chlorides.

The samples were collected near Philadelphia, in November.

ECONOMICS.

No record appears to exist of the use of the bark of the red pine in tanning, although the percentage of tannin would indicate the possibility of such an application. Its resin is also abundant and

would make it valuable for that constituent in the absence of other resinous pines. The wood is quite hard and durable, and is used in nearly all kinds of construction.

PINUS GLABRA, WALTER.

SPRUCE PINE.

GENERAL CHARACTERS AND OCCURRENCE.

This is a small-sized tree, 40 to 60 feet high, branching from near the ground, having whitish and smooth branchlets, and usually solitary cones, which are about 2 inches long and have the scales nearly destitute of spines. The wood of the tree is soft and white.

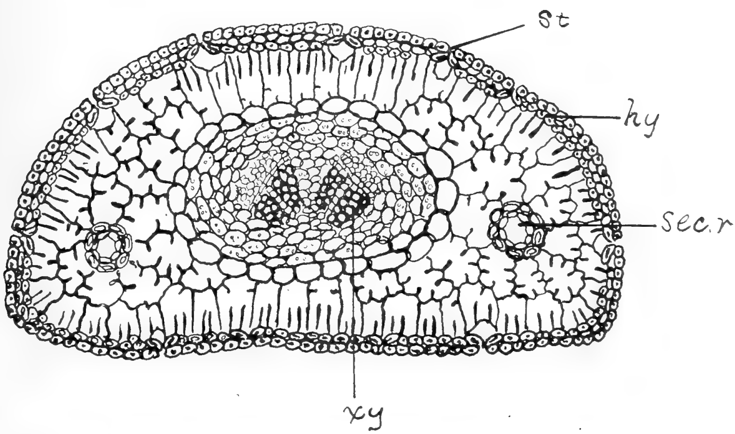


Fig. 30, cross-section of leaf of Pinus glabra, magnified 100 diameters. *St*, stoma; *hy*, hypoderma; *sec. r.*, secretion reservoir; *xy*, xylem of one of the two bundles.

The species occurs in South Carolina and Florida, and is there known as the spruce pine.

Its leaves are in twos, slender, scattered, 3 or 4 inches long, from a sheath about $\frac{1}{6}$ inch long. On the flat surface are about six rows of stomata, and on the convex about nine rows.

MICROSCOPICAL STRUCTURE.

The cross-section showed, underneath the thick-walled epidermis, a usually two-layered, but sometimes only one-layered, hypoderma, the outer of these with its cell walls but slightly thickened, the inner with its walls considerably thickened. The secretion reservoirs are usually two in number, one opposite each of the angles of

the leaf and about midway between the epidermal and the hypodermal cells. The circle of strengthening cells about the reservoir were observed to have their walls moderately thickened. The cells of the endodermis were large and had their walls somewhat thickened. Interior to the endodermis were no fibrous elements, except

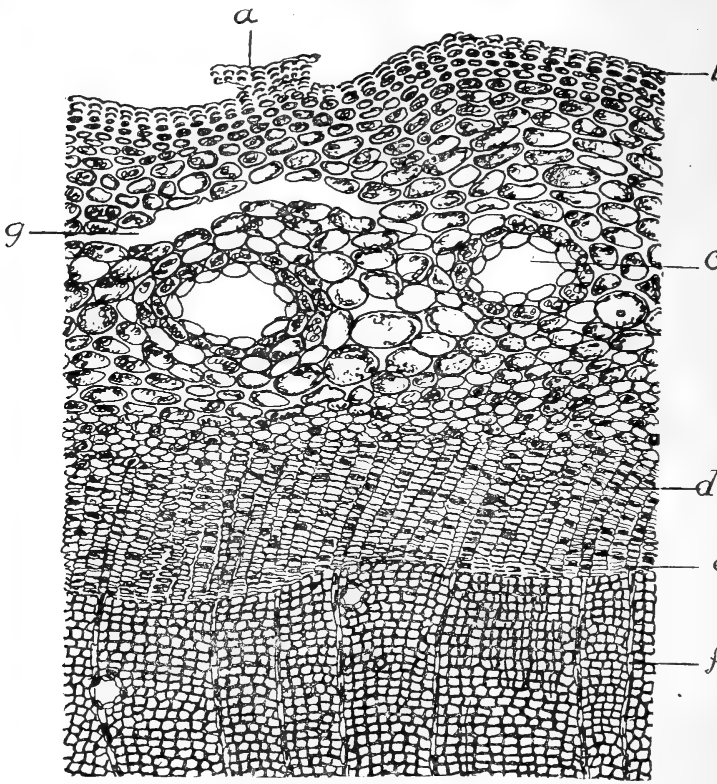


Fig. 31, cross-section of stem, two years old, of Pinus glabra, magnified 100 diameters. *A*, portion of remaining epidermis; *b*, thickish-walled periderm; *c*, secretion reservoir in cortex; *d*, bast layer; *e*, cambium; *f*, medullary ray in secondary xylem; *g*, lacuna. Drawing from specimen that had been treated with ferric chloride solution in absolute alcohol.

those contained in the small xylem bundles. The transfusion tissue, interior to the endodermis, and the folded mesophyll, exterior to it, presented no peculiar features.

A cross-section of a twig of three years' growth showed on the exterior fragments only of the epidermis, and of a few layers of

sublying parenchyma, the periderm appearing mostly at the surface. The outer layers of the periderm were thick-walled, the inner thin-walled and quite rich in tannic matters. The large-celled parenchyma next interior contained lacunæ and secretion reservoirs, and many of its cells were heavily charged with tannin. A few cells of this region were observed to contain crystals of calcium oxalate similar to those observed in Pinus Strobus. The bast layer was destitute of fibrous or other lignified elements, and had its tannin cells mostly arranged in radial rows. Most of the cells of this layer were small, but there were occasional larger ones containing tannin or oleoresin.

The xylem presented no important peculiarities, save that the walls of the tracheids showed less thickening than in most species of the genus.

CHEMICAL COMPOSITION.

We have been able to obtain a small quantity of the stem bark of this pine through the kindness of Dr. Charles Mohr. It was collected in February in the vicinity of Appalachicola, Fla.

In addition to the resin, the bark yielded the following data in regard to tannin and ash:

	Per Cent.
Moisture	7·44
Ash in absolutely dry substance	1·70
Tannin in absolutely dry substance	3·56

PINUS MONTANA, DU ROI.

GENERAL CHARACTERS.

This is the Dwarf, or Mugho pine of Southern Europe. It is frequently planted for ornament in American parks and gardens. It is a shrub, or small bushy tree, seldom attaining a height of more than 8 or 10 feet.

It bears rather small tapering cones, whose scales are tipped with slight prickles. Its leaves are 2 or 3 inches long, stiff, in twos, from a sheath about ⅓ inch long, flat on one side and convex on the other; stomata in about 6 or 8 rows on the flat surface, and in from 9 to 12 on the convex. The epidermis is large-celled, with the cell walls excessively thickened; the hypoderma is one-layered, and the walls of its cells are but slightly thickened; the secretion reservoirs are five or six in number, in contact with the hypoderma, and its circle of strengthening cells are thick-walled. The endodermal cells have their walls somewhat thickened. The vascular

bundles are rather small, and each has two or three medullary rays. Within the area enclosed by the epidermis there are either no

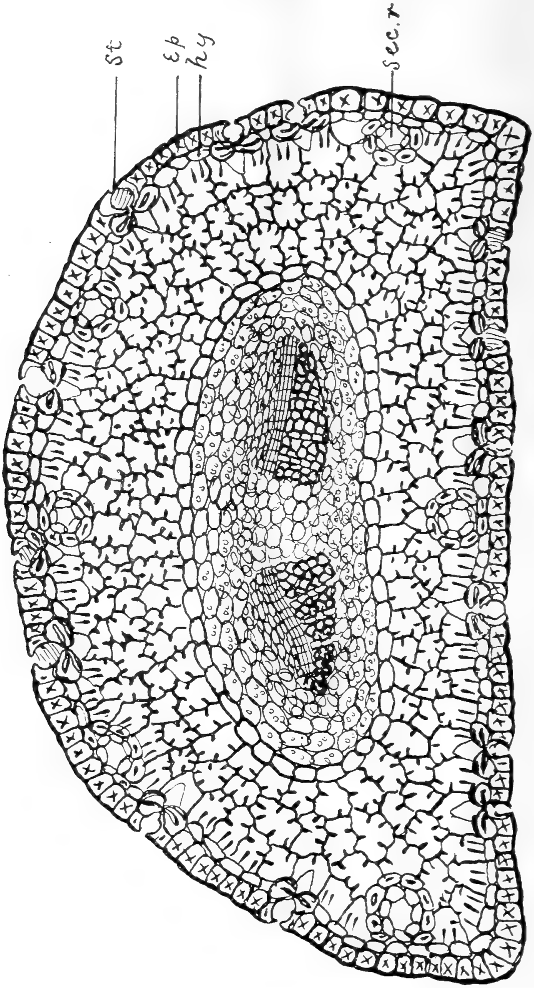


Fig. 32, cross-section of leaf of Pinus Montana, magnified 100 diameters. *St*, stoma; *ep*, epidermal cell; *hy*, thin-walled hypodermal cell; *sec. r.*, secretion reservoir.

lignified fibres, or only a very few, except those which belong to the xylem of the bundles. The mesophyll and transfusion tissues present no peculiarities.

MICROSCOPICAL STRUCTURE.

The cross-section of a twig of two years' growth showed in places the persistent epidermis, but there were frequent interruptions due to exfoliation caused by the growth of the periderm. When present it was excessively thick-walled, lignified and cutinized.

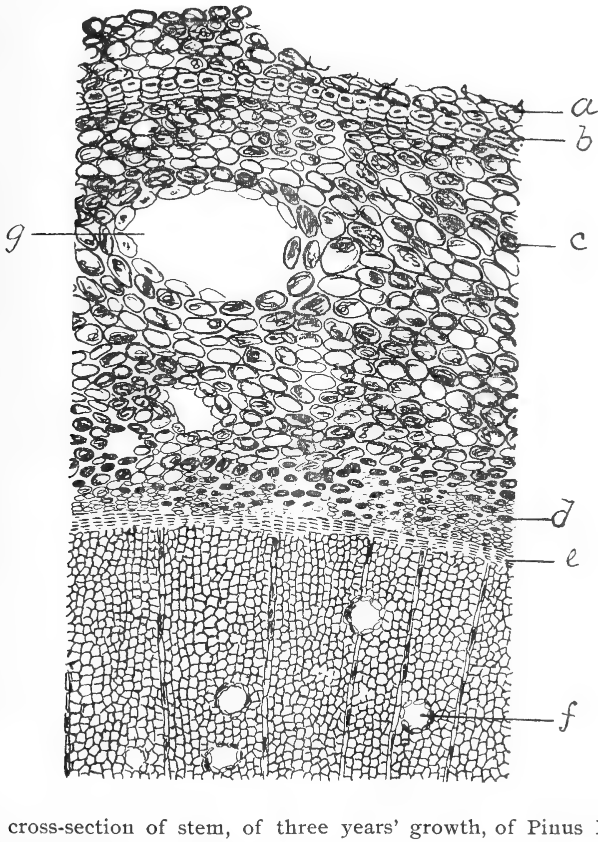


Fig. 33, cross-section of stem, of three years' growth, of Pinus Montana, magnified 100 diameters. *A*, disintegrating cells at the exterior; *b*, sclerotic cells of the periderm; *c*, tannin cells; *d*, tannin cell in bast layer; *e*, cambium; *f*, secretion reservoir in secondary xylem. Drawing made from specimen treated with solution of anhydrous ferric chloride in absolute alcohol.

Intervening between it and the periderm were a few layers of thin-walled parenchyma. The outer layers of the periderm were sclerotic, and the newer ones beneath thin-walled and rich in tannic matters. The cortical parenchyma, the bast layer, the cambium

and the xylem were similar in structure and in the distribution of the tannin and oleoresin to the corresponding parts of other members of the Pinaster group already described.

PINUS VIRGINIANA, MILLER.

PINUS INOPS, AITON.

GENERAL CHARACTERS.

This species is commonly known as the Scrub Pine or Jersey Pine. It is a low, straggling tree, from 15 to 40 feet high, the trunk seldom more than a foot in diameter, rough and dark-colored, top rounded or flattish, branches tortuous, spreading, young shoots purplish and glaucous, and branchlets frequently drooping. The cones are drooping, oblong-conical, sometimes curved, 2 or 3 inches long, persistent for several years, the thickened scales tipped with a straight or recurved awl-shaped prickle. Its leaves are rather stout and rigid, in twos, from short sheaths, 1½ to 2¾ inches long, usually somewhat twisted, with about ten rows of stomata on the flat side, and about twelve on the convex side; epidermis of small thick-walled cells, hypoderma about three-layered and also rather small-celled, the outer layer composed of thin-walled cells, the other two of thick-walled cells; the secretion reservoirs located in the mesophyll about midway between the hypoderma and the endodermis, and one opposite each angle of the leaf, sometimes also one opposite the middle of each face; the endodermis large-celled, with the walls of its cells but slightly thickened; the two diverging vascular bundles about five-rayed. There are few or no lignified cells interior to the endodermis, except those which belong to the xylem of the bundles.

MICROSCOPICAL STRUCTURE.

A cross-section of a stem of two years' growth showed the following structure: At the exterior an epidermis composed of rather small, thick-walled, lignified and cutinized cells was still present in places; underlying this were two or three layers of thin-walled parenchyma cells; this was succeeded by one or two layers of stone-cells, probably representing the outer layers of the periderm; the rather thick, cortical parenchyma was destitute of lignified elements, and contained very numerous tannin cells irregularly distributed among ordinary parenchyma cells, which contained little or none; in this region were also scattered secretion reservoirs of large size, similar

to those occurring in species already described. The bast layer was destitute of lignified elements, and contained numerous tannin cells commonly arranged in more or less distinct radial rows.

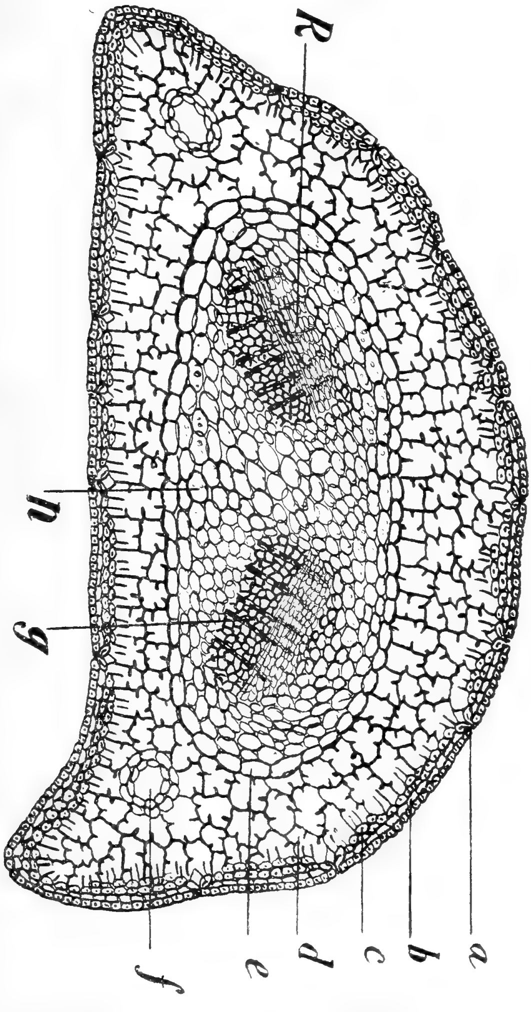


Fig. 34, cross-section of leaf of Pinus Virginiana, magnified 80 diameters. *a*, stoma; *b*, first layer of hypoderma, composed of rather thin-walled cells; *c*, second layer of hypoderma, composed of thick-walled cells; *d*, mesophyll cell; *e*, cell of endodermis; *f*, secretion reservoir; *g*, xylem of one of the bundles; *h*, transfusion tissue; *R*, phloem of one of the bundles.

The xylem showed no marked peculiarities, the tannin present being mostly confined to the medullary ray cells and the cells bordering the secretion reservoirs.

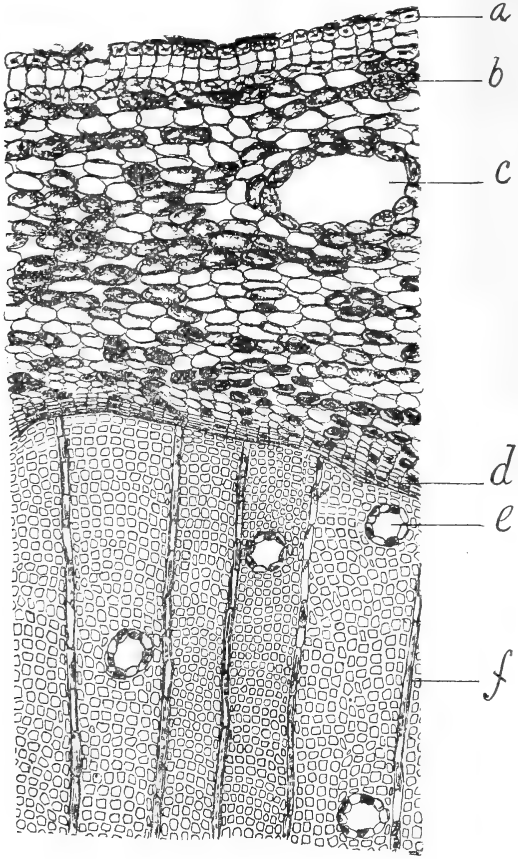


Fig. 35, cross-section of stem, two years old, of Pinus Virginiana, magnified 85 diameters. *A*, epidermis, composed of thick-walled cells; *b*, tannin cells of the cortex; *c*, secretion reservoir in the cortex; *d*, cambium zone; *e*, secretion reservoir in the xylem; *f*, medullary ray in xylem.

The species contains considerable oleoresin, which occurs not only in the secretion reservoirs and the secreting cells which bound them, but also in many of the tracheids of the xylem and in many of the ordinary parenchyma and tannin-bearing cells of the bark.

OCCURRENCE.

The tree grows in poor soil from Long Island to South Carolina, and westward to Kentucky. It abounds in southern New Jersey, eastern Virginia and in some parts of Pennsylvania.

CHEMICAL COMPOSITION.

A sample of the stem bark collected in southern New Jersey in November gave the following results for tannin and ash:

	Per Cent.
Moisture	12·92
Ash in absolutely dry bark	2·01
Tannin in absolutely dry bark	4·82

ECONOMICS.

Owing to its small size and the thickness of its sap-wood it is but little used for lumber, and, although it is rather rich in resin, it is not much employed as a source of this product.

The percentage of tannin would scarcely warrant the use of the bark in the manufacture of leather, except during a time of scarcity of other materials. The principal use of the wood is for fuel.

PINUS SYLVESTRIS, LINNE.

GENERAL CHARACTERS AND OCCURRENCE.

The Scotch fir or Scotch pine, as it is commonly called, is a native of Britain, northern Europe, the Alps, Pyrenees, Carpathian and Caucasus Mountain regions and northern Asia. It is also much cultivated as an ornamental tree in this country. It not only has a wide geographical range, but is capable of living under a great variety of conditions of soil and temperature. Under favorable conditions it attains a height of 80 to 100 feet and a diameter of from 2 to 4 feet. It has a straight trunk, covered with a deeply-fissured, reddish-gray bark, numerous, spreading, tortuous branches, and a rather dense, rounded or flattish top. Cones usually solitary, on short stalks, ovoid-conical before opening, about 2 inches long; scales woody, thickened at the ends, the apophysis rhomboidal, with a central tubercle. The leaves are usually in twos, from a scarious sheath about ¼ of an inch long, glaucous, rigid, bluish-green in color, from 1½ to 3 inches long, flat or channeled on the upper surface and convex on the lower, from eleven to thirteen rows of stomata on the flat or channeled surface, and from twelve to fifteen rows on the convex surface.

MICROSCOPICAL STRUCTURE.

A cross-section of the leaf showed a thick-walled rather small-celled epidermis, supported by a usually one-layered hypoderma composed of cells with moderately thickened walls. The secretion

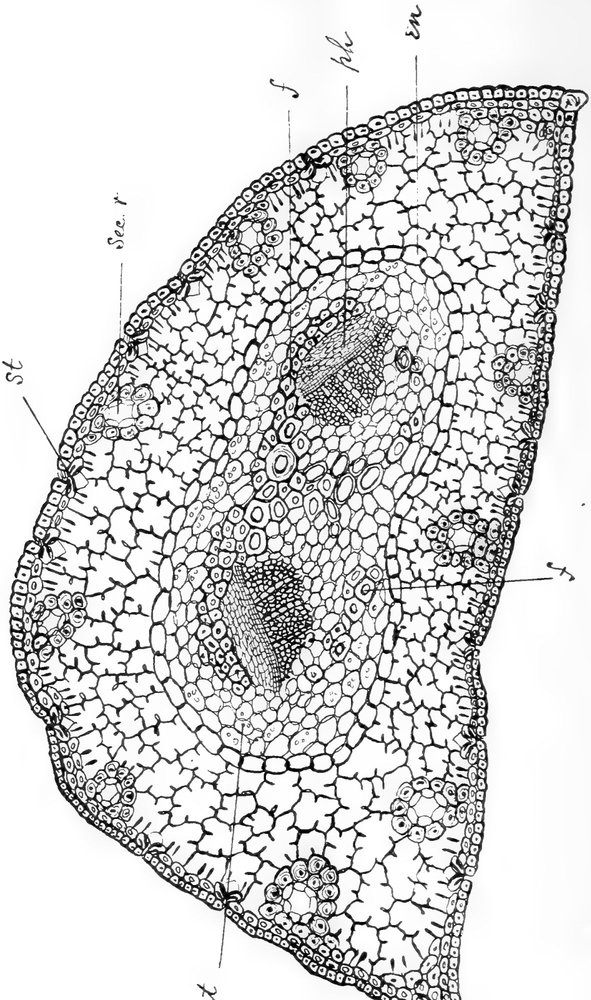


Fig. 36, cross-section of leaf of Pinus sylvestris, magnified about 90 diameters. *St*, stoma ; *sec. r.*, secretion reservoir ; *f*, fibres, very thick-walled, adjacent to the bast; *ph*, phloem of a bundle; *en*, endodermis; *f'*, fibres; *t*, transfusion tissue, consisting of short, pitted tracheids.

reservoirs were numerous, usually about ten, in contact with the hypoderma, and each had a circle of very thick-walled supporting cells. The endodermis was rather large-celled and the radial walls were thickened and cutinized. The two diverging vascular bundles were each about three-rayed. At the outer margin of the phloem were numerous thick-walled fibres; they also occurred between

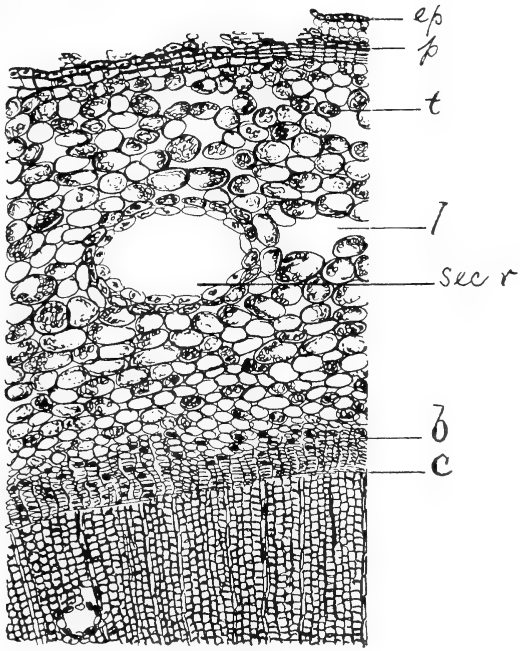


Fig. 37, portion of cross-section of stem, two years old, of Pinus sylvestris, magnified 100 diameters. *Ep*, epidermis; *p*, periderm layer; *t*, tannin cell in cortex; *l*, intercellular air space, or lacuna; *sec. r.*, secretion reservoir; *b*, bast layer of bark; *c*, cambium zone. Drawing made from a specimen that had been treated with a solution of ferric chloride in absolute alcohol, to show distribution of tannin.

the bundles and scattered in the transfusion tissue between the xylem of the bundles and the endodermis.

A cross section of the stem two years old showed the following structure: Fragmentary remains of the small-celled or thick-walled epidermis at the exterior; beneath it two or three layers of thin-walled cells; beneath this the periderm layer, the outer cells of

which were sclerotic; interior to this a rather thick cortical parenchyma, composed wholly of thin-walled cells, many of which are rich in tannin and resin, and in which occur secretion reservoirs of the usual character, and also some irregular lacunæ containing air; a bast layer composed of smaller cells, many of them containing tannin, all thin-walled, and arranged more or less distinctly in radial rows; a cambium zone, also containing tannin, and a xylem cylinder consisting of tracheids similar to those of the other pines; medullary rays which contained considerable tannin, and scattered secretion reservoirs, containing oleoresin and surrounded by cells which also contained tannic matters. Many of the tracheids and medullary ray cells contained oleoresin, as did also many of the parenchyma cells of the bark.

CHEMICAL COMPOSITION.

The leaves, stem bark and root bark from a tree of Pinus sylvestris grown in the vicinity of Philadelphia, and collected in November, have been examined for percentage of tannin and ash, with the following results:

	Moisture.	Ash in absolutely dry substance.	Tannin in absolutely dry substance.
Leaves	7·50	3·46	6·84
Stem bark	10·07	2·63	16·91
Root bark	10·04	2·66	13·17

The ash of the leaves contained potassium, iron and calcium carbonates, phosphates and sulphates.

The ash of the stem bark was similar to that of the leaves, with the exception of the iron. The ash of the root bark contained the same compounds that were found in the leaves.

The tannin and other constituents of an acid character, contained in this pine, have been studied by a number of European investigators, notably Kawalier (*Sitzber. der K. Akad. zu Wien*, 11, 344, 1853), and an appendix to this shortly after by Rochleder and Schwarz.

ECONOMICS.

This is a valuable timber tree, much used for lumber and shipbuilding in the countries in which it grows. Its heart wood is red-

dish, hard, resinous and very durable. It is also the source of a very considerable proportion of the tar and turpentine used in Europe.

A food is prepared in Norway from the innner bark, and from the leaves are manufactured a substance called fir-wool or pine-wool, which is employed for filling mattresses, as a surgical dressing, and even to some extent for the manufacture of woven fabrics.

(*To be continued.*)

FACTS IN THE HISTORY OF DOVER'S POWDER.

By William B. Thompson.

It would, indeed, seem to be very appropriate, as the century closes, to adopt into the archives of this College, some, at least, of the interesting treasures of history; not only those which may belong to that era of time through which this honored Institution has passed, and to those local events which have naturally become identified with it, but to that broader scope which has marked the progress of pharmacy throughout the world, and the epochs of its advancement as a science.

We are apt to forget that memory has a limit, and recollection becomes extinct, but that which is recorded on the page of history is, by transmission, imperishable. Therefore, while we may yet gather the instruction, let us not lose sight of the value it may yield to the votary and student of the future. The origin, lives, and personal history of eminent pharmacists are so replete with interest, so suggestive of patient labors, so full of the fruition of valuable and important discovery, as to become an inspiriting stimulus to effort, fostering at the same time that higher motive—the humane instinct of our nature. It has been almost wholly through the avenues of pharmacy that research and invention have given to the world those agencies of cure which have promoted and preserved human life. At the earliest dawn of civilization, pharmacy, with her crudities and simples, led the van of a crusade against disease and death. Medicine followed at her beckoning, and chemistry, born of alchemy, lent her aid to the work of disclosing the mysterious compositions of organic and inorganic matter. Thus pharmacy, the foster mother, found willing handmaids in the allied sciences. All then that pertains to this history, all that is interwoven with it, even fact, fiction

and romance, become the subjects of interest, and appeal for preservation at our hands. Our kindred institutions have awakened to the importance of incorporating in the literature of college historical clubs the traditions of the professions, and with these the instructive truths which a faithful narrative may hand down to posterity as a kind of legacy.

The topic which we have chosen for a brief consideration with you to-day has been suggested in the publication, by the Johns Hopkins Hospital Historical Club, on the life and personal history of Thomas Dover, physician and buccaneer, author and originator of Dover's Powder. Strange, indeed, it is that the inventor's fame should survive the lapse of two and a half centuries, and be perpetuated upon the seemingly unsubstantial support of a medical powder! Yet what tyro of the drug store of to-day does not associate with his alphabet of familiar preparations the well-known Dover's Powder; and is there anything more familiar to any of us? Yet, if the biographer had not coupled the career of Dr. Thomas Dover with a tinge of romance, attaching the story of a privateer's life and exploits at sea, quite likely, perhaps, Dr. Thomas Dover, as a name, would never have become known to fame and to us. This points to the moral of our plea for the safe custody of facts worthy of preservation at the hands of a college historical society.

We will not stop to discuss the merit of Dover's Powder more than to say its sterling value has never been superseded, and its therapeutic importance in specific use remains to this day unquestioned. We would fain worship at the shrines of many new gods, but the good old deities are yet worthy of our highest homage.

Thomas Dover was born in England in the year 1660. He settled and practised medicine for a time in Bristol; left there for a period and returned again. He lived with, and was contemporaneous with, Sydenham. He gained much professional reputation on the occasion of a severe epidemic of fever. This may have suggested to him the use of ipecac and opium in a compound. He seems to have scoffed a good deal at his brother doctors, and finally wrote and published a work, entitled "An Ancient Physician's Legacy."

In Dover's day and time, the apothecaries were in the ascendency, being the medical practitioners, whilst the doctors were called in to attend in childbirth and protracted illness. Indeed, it is stated that

then the apothecary surgeons rode in their chaises, while the doctors *walked*, and that the former were generally first consulted when the choice of a family physician was to be made. Mercury had at this time an unrestrained use—perhaps *abuse* would be a better word—and much severe public stricture was made upon the fact. Crude quicksilver was administered, and Dover was a warm advocate of its use—in fact, he was called the *quicksilver doctor*. One Captain Henry Coit, a patient of Dover, took an ounce and a quarter of crude mercury daily, until he had used more than two pounds weight! Dover professed to believe that mercury freed the patient from all vermicular diseases, opened all obstructions, and made a pure balsam of the blood. It is quite possible its ponderosity and gravity carried it unchanged entirely through the intestinal processes, and it may have had the merit of utility—that is, it could be used on another patient after its exit from the previous one. The doctors and apothecaries were at loggerheads. Dover said the best way to affront the latter was to order too little physic—each patient being deemed to be worth a certain sum to the dispenser. The apothecaries discriminated in their preferences among physicians—more natural, perhaps, than politic—generally favoring those who would write the longest and most numerous prescriptions; so that, between drugging and expense, the lot of the invalid has at no time been enviable. Nor need we attempt to conceal the fact that the relations between prescriber and dispenser have never been long harmonious, each by turn exercising a lion-like aggressiveness, and neither evincing a lamb-like submissiveness. But we must come to the romance of our narrative. In 1708, Dover joined the company of a group of Bristol merchants in a scheme to fit out two vessels for privateering, or piracy, in the South Seas. Dover, it seems, went as captain, and the voyage was eminently successful in booty. They took, in various reprisals from the marauding, thieving Spaniards—the then buccaneers of the high seas—the hoards of treasure and gold which they in turn had filched from the native Indians—the principle of *might* applied to *right*. The expedition returned to Britain, enriched with spoil, the treasure amounting to £170,000 sterling. It was during this memorable voyage that Dover, landing with some of his crew on the island of Juan Fernandez, discovered the existence of Alexander Selkirk—Robinson Crusoe—in his dreary solitude on this desert shore. Our biographer then relates

many interesting incidents, which are the *facts* of the life and history of this hero of a wonderfully vivid romance. But the story is so familiarly inwrought in the literature of our nursery and boyhood days that it needs no repetition to you here. Our purpose has been served in giving you incidents in the life of Dr. Thomas Dover, and in the events which led him to create a medicinal powder, than which no composition could be more simple; yet it has stood the test of time quite beyond anything which appears in the annals of pharmacy and medicine, so that the days of patient searching and of little things may not yet be passed.

"Dover's Powder may be viewed as one of the few surviving relics of mediæval polypharmacy, which have maintained their existence even in this age of progression and scientific medication. The formula presents a forcible illustration of that happy combination where the properties and character of one substance effectively aid the other. Whilst opium constricts and checks the secretion of the digestive ferments, the tissue metabolism, and also the excretion of toxines by the liver and kidneys, ipecacuanha antagonizes every one of these actions; opium restrains the nauseant effect of ipecac; both together, in union, determine to the skin, and to the bronchial mucous membrane, relaxing the vaso-motors and allaying the inflammatory diathesis!"

In conclusion, it might be well to note the fact that the method of preparing Dover's Powder originally differed very essentially from the present process, both in practice and in principle. This part of the subject might form an essay from some of our younger brethren. The doses of that day corresponded exactly with the treatment—they were appallingly heroic to our senses. Blood to depletion, blisters to excoriation, and 70 grains of Dover's Powder, in a glass of white wine possett on going to bed, was considered specific enough for an acute impending gout!

Large deposits of platinum-bearing ores are said to have been discovered at Fitfield, New South Wales. It has been known for several years that platiniferous lead existed in that locality, and the deposits have been worked, though only on a small scale. It is now found, however, that the platiniferous lead deposit is over a mile long, varying in width from 60 to 150 feet, and covered with 60 to 70 feet of loam. The precious metals are practically confined to the bed rock and the drift for 3 inches above the bottom. Nuggets which weighed from a few grains up to 5 pennyweights have been occasionally found. The crude metal contains about 75 per cent. of platinum, and realizes at the present time upon the field about $6 per ounce.

EDITORIAL.

LAWS REGULATING THE CHARACTER OF FOODS AND DRUGS.

The paper on another page of this issue, by Prof. J. U. Lloyd, concerning "The Pharmacopœial Standard," furnishes much food for thought. The author does not in any way exaggerate the difficulties which beset the pharmacist, and his remarks to the Pharmacopœia Committee are suggestive rather than critical.

Legislators in endeavoring to arrive at some standard for medicinal preparations naturally turn to the Pharmacopœia, which is largely of the pharmacist's own making. It is to the credit of the latter that while he created a standard which he is endeavoring to live up to himself, he made its requirements too severe for it to be arbitrarily interpreted by every political appointee.

The Pharmacopœia defines the purity of some substances to the minute fraction of 1 per cent., while the physician may administer those same substances in quantities measured by that arbitrary standard, the teaspoonful, and thereby give 50 per cent. more or less than he intends.

Professor Lloyd calls attention to "the curious fact that the very thoroughness and precision of the Pharmacopœia may furnish a source of hardship to those whom it was intended to aid, on account of its being looked upon as the legal code by persons who are appointed to enforce laws regulating the purity of drugs."

One of the ways out of this difficulty is to change the Pharmacopœia; but there are very few pharmacists who would like to see this excellent standard lowered or changed, except for more exact and expeditious methods. Another remedy is to not have the Pharmacopœia the standard under which the laws are enforced. It has been found possible to apply laws to the sale of foods and other unofficial substances without the aid of such an exacting standard.

A third remedy is to have no laws governing the character of drugs, and this is by no means the worst suggestion, for it is the condition under which the great majority of people in this country are living at the present time. In many States, where such laws exist, they are not enforced, and yet it is possible anywhere in the United States for a person to buy pure drugs.

Laws regulating the practice of pharmacy have generally been satisfactory because it has usually been found necessary to give the administration of these laws into the hands of practical pharmacists; but when it comes to appointing inspectors to govern the character of foods and drugs, it usually happens that some one is put into the position because he is good for nothing else, and, of course, he makes a failure of his new venture. Pharmacists will make no mistake if they oppose the enactment of every law which has anything about the quality of drugs in it, until they can at least have the legislative committee of their State association investigate it.

FORMULAS FOR BITTER WINE OF IRON.

We recently noticed in a Belgian exchange (the *Annales de Pharmacie*) a short communication on bitter wine of iron, which is rather severe on those who have been proposing superior formulas for that preparation during the past twenty-three years. At the same time, it might be read with advantage by

those who are constantly suggesting new formulas for various other preparations without any real excuse except the desire for a change. The article in question is by H. J. Bultot, pharmacist, of Liège, Belgium. He calls attention to the fact that bitter wine of iron is daily prescribed in that city, and he offers the formula which, as he states, was published by Dr. Charles L. Mitchell in the AMERICAN JOURNAL OF PHARMACY, November, 1873. This formula, he says, gives entire satisfaction, and he has always dispensed the preparation made according to it, notwithstanding the fact that there are a great number of other formulas, which he delicately designates as "fantasistes et economiques."

The pharmacopœia committee have removed the necessity for any new formulas for this remedy in the United States; still, it is a question whether, in authorizing the present one, they did not make considerable sacrifices of elegance in order to obtain simplicity, and, as a result, many pharmacists in this country are still using the formula of Dr. Mitchell, or else each employs some favorite one of his own.

THE PENNSYLVANIA PHARMACEUTICAL ASSOCIATION.

The pharmacists of this and some adjoining States are interested in the meeting of the Association to be held at the Holly Inn, Mt. Holly Springs, Cumberland Co., Pa., June 16, 17 and 18, 1896.

The first session will be held on the afternoon of Tuesday, the 16th, at 4 o'clock, in the parlor of the hotel, and the exercises will close on Thursday evening, the 18th. Friday will be devoted to an excursion to Gettysburg.

Mt. Holly Springs may be reached by any railroad which runs into Harrisburg. Trains leave Harrisburg for Mt. Holly daily at 8 A.M., 12 M. and 4 P.M.

Rooms may be secured in advance by writing to Mr. Harry R. Landis, proprietor of the Holly Inn. Rates, $2 per day.

A large room will be devoted to the exhibition of pharmaceutical preparations. John F. Patton, York, Pa., is local Secretary.

RECENT EXAMINATIONS BY THE PENNSYLVANIA STATE PHARMACEUTICAL EXAMINING BOARD.

At the recent meetings of the Pennsylvania State Pharmaceutical Examining Board, in Pittsburg and Harrisburg, 356 applicants appeared for examination, 110 at Pittsburg and 246 at Harrisburg. Of this number 86 succeeded in passing the examination for a registered pharmacist's certificate, and 97 for that of a qualified assistant's certificate. This is the largest class of candidates ever examined by the State Examining Board, and also the largest percentage of successful candidates, which is entirely due to the fact that nearly all the applicants now coming before the Board for examination are either matriculates or graduates of a college of pharmacy. The next meetings of the Board will be held at Bradford, on Tuesday, July 7th, and Williamsport, on Thursday, July 9th. The secretary of the Board is Dr. Charles T. George, of Harrisburg, Pa.

AMERICAN PHARMACEUTICAL ASSOCIATION.

Section on Scientific Papers.

Samuel P. Sadtler, Ph.D., Chairman, Philadelphia, Pa.; William C. Alpers, Secretary, Bayonne, N. J.; Lucius E. Sayre, Associate, Lawrence, Kan.

QUERIES.

(1) *Sanguinaria.*—The liquid preparations slowly deposit a precipitate upon the sides of the containers. Can a menstruum be devised which will hold permanently in solution the soluble constituents?

(2) *Gelatine Capsules.*—What general rule should be adopted in compounding prescriptions ordering gelatine capsules? When should the ingredients be dispensed in dry powder, and when is it preferable to form them into a mass?

(3) *Ichthyol.*—Ichthyol is now being used internally, dissolved in water and other media. A palatable form of administration is wanted.

(4) *Salol and Acetanilid* are given usually in powder form. Cannot formulas for therapeutically unobjectionable liquid preparations of the same be devised?

(5) *Salicylic Acid.*—It has been alleged that the synthetical salicylic acid now in the market occasionally shows the presence of salol. Is this statement correct, and if so, to what extent?

(6) *Formalin.*—A 40 per cent. solution of formaldehyde under that name is attracting much attention as an antiseptic and deodorizer. A good practical formula for its preparation by the retail pharmacist is wanted.

(7) *Kamala.*—It is supposed that resin is the active constituent. Investigation recommended. Is a tincture advisable?

(8) *Pyrethrum Carneum, Pyrethrum Röseum, Pyrethrum Cinerariæfolium.*—Insect powder. Can it not be used as a medicine? On what depend their insecticide properties?

(9) *Veronica Officinalis* is used largely as a house remedy for pectoral complaints and skin diseases. Is there any alkaloid or other active principle in the plant to warrant such use?

(10) *Viscum Album* (*Mistletoe*) is used by practitioners to arrest post-partum and other uterine hemorrhages. Investigation invited.

(11) *Pichurim Beans.*—What are they? Various descriptions of their oils are given by different investigators.

(12) *Strophanthus Seeds.*—A determination of the active principles in the seeds of commerce, their nature, quantity and method of valuation.

(13) *Pareira.*—Pareira is a valuable diuretic and tonic drug. Buxine has been found in it, but this can hardly be the important principle. What is it?

(14) *Rhus.*—What is the really potent principle of the Rhus group? Is it a volatile acid, as claimed by Maisch, or is it a substance resembling cardol?

(15) *Tannin.*—At what season of the year should the tannin drugs be gathered? What relation does the amount of tannin present bear to that of starch? Does the tannin increase as the starch decreases? Or, is this true of some drugs but not of others?

(16) *Cypripedium.*—There appears to be a poisonous principle, producing effects similar to those of *Rhus toxicodendron*, in the glandular hairs of some cypripediums, particularly *C. spectabile.* What is this principle?

(17) *Iris.*—The rhizomes of many species of iris abound in starch, as the species that furnish the orris root of commerce, but the rhizomes of *Iris versicolor* and of the *Iris pseudo-acorus* do not turn blue with iodine solution. What is the carbohydrate present?

(18) *Veratrum.*—By what means may the rhizomes of *Veratrum album* best be distinguished from those of *Veratrum viride?* Some method is desirable by means of which this may be done easily and with certainty.

(19) *Aconites.*—The different aconites are very liable to be confounded. In the case of drugs so potent it is exceedingly important that the structure of each species liable to be gathered or sold for the official should be carefully described. Some one should undertake the task of the thorough investigation of the microscopical structure of all the species.

(20) *Pepsin Test.*—A discussion of the variable results obtained in the tests.

(21) *Cotton-Seed Oil.*—A review of the tests for its presence as an adulterant in other fixed oils.

(22) *Cod Liver Oil.*—Are the official tests sufficient to distinguish a pure cod liver oil? If not, what additional ones should be adopted?

(23) *Methyl Acetate.*—Write a paper on the possible use of methyl acetate as a solvent in pharmacy.

(24) *Sodium Bisulphite.*—The sodium bisulphite of commerce is rarely found more than one-fourth the strength required by the U. S. Pharmacopœia. Is the official standard too high, or does this saltrapidly deteriorate on keeping?

(25) *Terpeneless Volatile Oils* are now articles of commerce. Are they liable to deteriorate on keeping? How much stronger are they than ordinary volatile oils?

(26) *Lard Oil.*—Lard oil appears to be grossly adulterated. Is it possible to obtain lard oil in the open market of the standard of purity of the U. S. Pharmacopœia?

(27) *Guaiacol.*—Commercial guaiacol varies in purity from 50 to 90 per cent., according to Dr. Squibb. Cannot some process be devised for its assay and purification, if necessary?

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

PROCEEDINGS OF THE AMERICAN PHARMACEUTICAL ASSOCIATION at the forty-third annual meeting, held at Denver, Colorado, August, 1895.

The only important part of this book, which we have not already reviewed, is the Annual Report on the Progress of Pharmacy, by Henry Kraemer. These 647 pages contain much valuable matter; in fact, it is the best digest of pharmacy for one year that has ever been published in this country. It will always be valuable for reference, especially to assist investigators in finding original papers when it is necessary to go back of the abstracts given. This report covers the period from June 30, 1894, to July 1, 1895, and to have been of the greatest benefit to the members it should have reached them not later than October of last year. It was not, however, published until about the first of May, 1896, so that some of the material contained in it lacks two months of being two years old.

We are not seeking to criticize any particular individual for this delay in

publishing the Proceedings, for it is probable that no individual is at fault. There is probably a reason for the delay, and the fault lies with the Association in not creating means whereby members may have the Proceedings promptly. The papers read at the meetings of the Association are usually published at once in various pharmaceutical journals, but the Report on the Progress of Pharmacy does not thus become public; it is too long to read at the meetings or to publish by private enterprise, so it is allowed to become partly useless by delay. It strikes us that this Report might be issued immediately after the meeting, in paper cover, although before considering that question it would be just as well to determine whether or not it is possible to issue the complete Proceedings within two months after the adjournment of the meeting.

RECHERCHES SUR LA CINCHONICINE. Thesis presented to the *École Supérieure de Pharmacie de Paris*, to obtain the diploma of "Pharmacien de premier classe," by M. Ferdinand Roques. Presented and sustained the 23d of April, 1896.

The author has shown that cinchonicine, instead of being amorphous and resinous, as heretofore supposed, is crystallizable, although he had previously stated this fact (*Compt. rend.*, 120, 1170). He also describes the preparation of numerous new derivatives of cinchonicine and some new salts.

A COURSE OF HOME STUDY FOR PHARMACISTS. First Lessons in the Study of Pharmacy. By Oscar Oldberg, Ph.D. Second edition. Chicago: The W. T. Keener Company, 1896.

We learn from the preface that the "Home Study for Young Pharmacists" is designed to be read without aid or guidance from any teacher. It will be in order, therefore, to examine how far the author has accomplished his purpose.

The introduction, of twelve pages, is quite readable, and could in part be comprehended by the young beginner, especially in that portion where he is told that the "Home study in pharmacy is of tried value as a course of preparatory reading. At the school of pharmacy, the difference between the student who has carefully read that book and the student who has not pursued any such preliminary reading is very marked."

We presume by school of pharmacy that the author means the one in which he is Dean. He, therefore, evidently takes the trouble to inform himself as to whether the students have read his book or not, for we can hardly believe that the difference between those who have read it and those who have not is so apparent that he can distinguish them without inquiry.

Nearly four pages of the introduction are occupied with the question whether a student shall take his store experience before or after he attends a college of pharmacy. These four pages possess, in a high degree, a resemblance to a number of papers which the author has from time to time presented to the American Pharmaceutical Association.

Leaving the introduction, we come to the course of study proper.

Part I, we are told by the author, covers the whole field of physics, but "only such as have a special interest to the student of pharmacy are treated at any length."

Part II is devoted to chemistry, and a large number of the symbolic formulas have been printed in two colors. This has not been a mechanical success,

and will necessarily be a source of confusion to the student, when he sees the red negative radical situated at all kinds of angular distances from its positive associate. Besides, it is a pity to teach a beginner the dualistic idea in nomenclature, when he will have it to unlearn if he ever gets at the foundation of the subject.

Part III presents definitions of such general terms as medicines, drugs, pharmacopœia, pharmacy, etc., and one chapter consists of a review of the various classes of chemical constituents existing in plant drugs.

Part IV discusses pharmacy in 136 pages, and it may be said of it, as of each one of the other parts, that it is too small a space in which to consider such a large subject.

There are on the market now a number of series of books under the general title of "aids," "compends," etc., and, if we leave out the introduction of this book, it belongs in the same category with them. It is just such a work as the would-be pharmacist seizes with the forlorn hope of making a short cut into the ranks of the pharmaceutical profession without an education. He will be doomed to disappointment in the book before us, however, for a large part of it would be absolutely incomprehensible to a young man who had not had at least several months of store experience.

A Dictionary of Chemical Solubilities, Inorganic. By Arthur Messinger Comey, Ph.D. Macmillan & Co., London and New York. 1896. Received from John Wanamaker, Philadelphia. Price, $5. Pp. 515.

No book on this subject has appeared since the publication of Storer's Dictionary of Solubilities of Chemical Substances, in 1864.

Such a work is largely a labor of love, and Dr. Comey deserves the gratitude of chemists and pharmacists for his unselfish devotion to the subject. He has been unable to verify the figures; that would be a physical impossibility; so he has, as far as possible, quoted all the reliable authorities, although in some cases quite contradictory results have been obtained and recorded by different investigators.

For the data previous to 1860 considerable use has been made of the above-mentioned Storer's Dictionary, and, to obtain those since that time, the author has consulted a large number of authorities. The work has been brought up to March, 1894. The appendix contains formulas and tables for the conversion of the degrees of various hydrometer scales into specific gravity, and a synchronistic table of the periodicals to which references are most frequently made.

Technology Quarterly and Proceedings of the Society of Arts. Massachusetts Institute of Technology. Boston, December, 1895.

This valuable publication has, in the last four numbers, given space to a "Review of American Chemical Research," under the direction of Dr. A. A. Noyes, of the Institute. It is more complete than anything of its kind that has heretofore appeared on this subject, and cannot but be of value to every one who tries to keep pace with the progress made in the science of chemistry in this country.

Vierteljahresschrift über die Fortschritte auf dem Gebiete der Chemie der Nahrungs- und Genussmittel. 1895. Heft 4.

ANNALES DE CHIMIE ANALYTIQUE is the title of a new semi-monthly from Paris. It is under the direction of C. Crinon, assisted by a well-known corps of collaborators. The first numbers contain valuable analytical contributions, and indicate a useful future.

ARCHIV FOR PHARMACI OG CHEMI. A. Kloecker, editor, Copenhagen, Denmark. The fifty-third volume appears in an enlarged and otherwise improved garb. This journal was begun in 1844, by S. M. Trier, who conducted it for fifty years (to 1894), and, with the exception of the last three years, entirely alone.

Of original articles it shows very few, often for years none. It was and is chiefly a "repertory" of pharmacy, chemistry, physics and applied chemistry.

The new editor has infused more life into it.

That pharmacy in Denmark is by no means behind times is shown by two advertisements: "Situations wanted. A lady (twenty years of age) who has been apprentice for eighteen months, desires a situation in another part of the country so that she can finish her studies."

Four female apprentices are in want of situations. H. M. W.

KORT OVER DENMARK'S APOTHEKER. List of Danish pharmacies, accompanied by a map, showing the location.

We learn that Denmark has 81 "real" pharmacies, 88 "personal," 7 branch stores, 160 physicians who may sell medicines, 11 physicians who are permitted to dispense their own medicines but not keep store (both of the latter are bound to take their medicines from one or more designated pharmacies), and, finally, 10 general stores where medicines may be sold, except poisons and potent drugs and preparations, but they must not put up medicines.

The chief difference between the "real" and "personal" pharmacies (or rather, privileges) is that the former represent valuable pieces of property and may be sold, often at quite fancy prices, while the "personal" cannot be sold, but are merely permits to locate and conduct a pharmacy in a certain place, which permit expires with the death of the widow. The would-be successor has to petition the proper authority for a new permit, which may or may not be granted him. In such cases the fixtures and stock are sold as any other store, at invoice. The widow has to put the store in charge of a graduate in good standing, unless she herself happens to be a graduate. H. M. W.

UEBER DIE ANWENDUNGEN DER GUAJAKHARZ-LÖSUNG (GUAJAKTINCTUR) ALS REAGENS. Von Ed. Schär.—Although this interesting communication was published some time ago, this is the first copy to reach us in the form of a separate reprint.

BEITRÄGE ZUR CHEMISCHEN KENNTNISS DER PFEFFERFRUCHT. Von F. E. Bauer und A. Hilger.

This is the most notable paper in the April issue of *Forschungs-Berichte.*

BRAZILIAN AND COLUMBIAN IPECACUANHA. By Dr. B. H. Paul and A. J. Cownley. Reprint from *Pharmaceutical Journal,* April 25, 1896.

SEMI-ANNUAL REPORT OF SCHIMMEL & CO. (Fritzsche Brothers), Leipzig and New York. April, 1896.

LIST OF PUBLICATIONS OF THE U. S. DEPARTMENT OF AGRICULTURE, from 1841 to June 30, 1895, inclusive. Government Printing Office. Washington. 1896.

CONTRIBUTIONS FROM THE U. S. NATIONAL HERBARIUM. Vol. III. No. 7. Issued April 1, 1896. By John M. Coulter. This consists of a "Preliminary Revision of the North American Species of Echinocactus, Cereus and Opuntia." Washington. 1896.

UEBER EINE EIGENTHÜMLICHE NEUE MAGNESIUM-VERBINDUNG, and UEBER EINE NEUE BILDUNGSART DES MAGNESIUM NITRIDES (Stickstoff-Magnesium), both by Dr. J. M. V. Sztankay, Bath, Hungary, and reprinted from *Pharmaceutische Post.*

MINNESOTA BOTANICAL STUDIES. Bulletin No. 9. Part VIII, with three plates. April 30, 1896. Conway MacMillan, State Botanist.

SOUVENIR OF THE TWENTY-SIXTH ANNUAL MEETING OF THE NATIONAL ECLECTIC MEDICAL ASSOCIATION, to be held in Portland, Ore., June 16 to 19, 1896. Handsomely illustrated.

COMPLETE CATALOGUE OF THE PRODUCTS OF THE LABORATORIES OF PARKE, DAVIS & Co. Detroit. Revised February 25, 1896.

MINUTES OF THE PHARMACEUTICAL MEETING.

The last of the present series of Pharmaceutical Meetings was held in the Chemical Lecture Room of the College, May 19th, at 3 o'clock, with Mr. Wm. McIntyre in the chair.

The reading of the minutes of the previous meeting was omitted.

A number of interesting specimens were exhibited, which may be enumerated as follows: Two samples of gum products of the mesquite tree, one an exudation of Opuntia fulgida and one from Larrea tridentata, all of which were presented by Professor James W. Toumey, of the University of Arizona; a specimen of asparagus, illustrating the peculiar form of growth known in botany as fasciation, and produced apparently in this case by the lateral union of several stems, was presented by Dr. Charles Schäffer; two specimens of fish sounds, of rather large size and somewhat unusual in appearance, were presented by Messrs. Wm. R. Warner & Co.; and Mr. Charles Bullock presented a valuable piece of apparatus intended for the purpose of treating substances with gas with the application of heat. It consists of a small iron retort having a detachable lid, which is closely fitting and clamped when in use. Two brass tubes are adjusted to the lid, one for conducting the gas to the substance treated and the other for carrying off the products. An important application of the apparatus will be for the generation of oxygen in experiments by laboratory students.

A vote of thanks was tendered the donors of the specimens.

The first paper on the programme was presented by Mr. Wm. B. Thompson, and was entitled, "A History of Dover's Powder." (See page 337.) The author emphasized the necessity of preserving data which may become of historical value, and not only related the origin of this drug, which has been

highly esteemed as a therapeutic agent for more than two centuries, but also gave an interesting biographical sketch of its originator, Dr. Thomas Dover, who at one time during his career was engaged as a buccaneer.

In the discussion which followed the reading of the paper, Mr. Thompson stated that potassium sulphate is probably to be preferred to sugar of milk as a diluent for Dover's powder on account of the trituration required to reduce it to a fine state of division. Mr. E. M. Boring referred to Squibb's process for this preparation, which consists in reducing to powder crystals of sugar of milk, opium and ipecac roots by grinding them together.

Mr. Charles H. LaWall read the second paper, the subject of which was "A Method of Assay for Sanguinaria and Its Preparations." (See page 305.) Four modifications of the general assay processes now coming into use were employed by the author, with the conclusion that, working upon a practical scale, the benzin process gives uniform results with a given sample of the drug, and may be used for standardization. The process formulated by him is as follows:

	Grammes.
Drug (No. 50 powder)	10
Petroleum benzin	100
Aqua ammoniæ	10

Macerate for four hours with frequent agitation; then add 5 grammes additional of aqua ammoniæ; shake well and separate the quantity required for assay, the final extraction of the alkaloid being effected by the use of heavy chloroform ether (chloroform 3 volumes, ether 1 volume). The conclusion was also reached that 1·50 may be considered the average alkaloidal per cent. of the commercial drug. Samples of the chloride of the alkaloids of sanguinaria prepared by the author were shown.

A paper, entitled "The Pharmacopœial Standard," was contributed by Prof. J. U. Lloyd, of Cincinnati, O. (See page 297.)

The author is of the opinion that a large number of the exacting pharmacopœial descriptions should be modified, and considered a number of official compounds, dividing them into three classes:

In the first class he placed those substances which rapidly deteriorate, and showed how they might be fully up to the standard when freshly prepared, but fall below it within a short time. The second class embraced such substances as are demanded of a strength by the Pharmacopœia that renders their production impractical or unnecessarily expensive. In the third class were included such substances as are used largely in the arts and the demands of commerce, and which the necessities of manufacture or custom have established of a different quality from the official standard.

The writer concludes with the belief that a scale of reasonable variations should be affixed to every official preparation.

This paper elicited considerable discussion.

Mr. Thompson remarked that those entrusted with the administration of the laws are filled with zeal, and construe them too literally and rigidly, but that the final outcome of the difficulties will be the establishment of more rational standards, and that interest will be centered upon this work and not upon litigation as at the present time.

The chairman held a similar view of the matter, and said that the main difficulty lay in the prosecution of ideas, rather than the consideration of principles of equity.

"The Tannins of Some Ericaceæ" was the subject of a paper presented by Miss Bertha L. DeGraffe. (See page 313.) In her work the author investigated the following drugs of the natural order Ericaceæ: Uva ursi, gaultheria, chimaphila, manzanita, mountain laurel and trailing arbutus. The tannins were extracted from the drugs with acetone, and, after a series of preliminary manipulations to purify them, qualitative tests were made with the customary reagents, to determine to which tannin group (the gall tannin or oak bark tannin group) the principles so obtained belong, but with not wholly satisfactory results. Decompositions were then attempted for the same purpose, but with like results. As a final means of classification, ultimate analyses of the principles were made. The results showed the tannins of uva ursi and manzanita to have the same percentage composition as gallotannic acid, and those of gaultheria, trailing arbutus and mountain laurel to belong to the oak bark group. The tannin of chimaphila was found difficult to purify, but the author was of the opinion that it belongs to the oak bark group. Samples of the purified tannins from the drugs previously mentioned were exhibited.

Prof. Henry Trimble contributed the last paper, which was entitled "Recent Literature on the Soja Bean." (See page 309.) The author stated that soja bean and its products constitute an important proportion of the food of the inhabitants of India, China and Japan, its richness in proteids supplying the deficiency of these bodies in the principal food, which is rice. Recent analyses show it to contain as high as 42·05 per cent. of crude protein and 20·46 of fat. It also contains an active diastatic ferment, which is said to have a powerful action upon starch. The principal products of the bean are *miso*, which is made by subjecting the steamed beans after cooling to the action of a diastatic ferment made from rice or barley; *natto*, which is made by submitting boiled beans to a warm temperature for 24 hours, whereby a decomposition of the proteids is effected; and *tofu*, which is a form of vegetable caseine. Attention was called to a sample of the beans purchased in New York City, which, in the dry condition, more nearly resemble peas than beans.

An attractive feature of the meeting was an exhibition of lantern slides of botanical subjects, and photographic views along the line of the Canadian Pacific Railway, by Dr. Charles Schäffer, of this city. These views were projected on a screen by means of an electric lantern, and were of popular interest as well as scientific character.

A unanimous vote of thanks was tendered Dr. Schäffer for the entertainment furnished by him, and to Professor Trimble for having procured his services.

On motion, the meeting adjourned.

THOS. S. WIEGAND,
Registrar.

It has been decided to offer a reduction of 50 per cent. on the price of all Proceedings of the American Pharmaceutical Association prior to 1891. The Reports of 1856 and 1859 are out of print and none were published in 1861. Orders should be addressed to Prof. Charles Caspari, Jr., 109 Asquith Street, Baltimore, Md.

OBITUARY.

CHARLES O. CURTMAN.

The record of Dr. Curtman's life is that of a man who was constantly striving and achieving. Born in Giessen, Germany, in 1829, he acquired a thorough classical education and then turned his attention to chemistry. He was a pupil of Liebig and afterwards an assistant of Knapp, the technologist.

In 1849 he decided to go to America, and, after arriving in New York, he slowly made his way to New Orleans, where he engaged in the drug business.

At the beginning of the war, Dr. Curtman became surgeon in the Confederate service, but later became the director of the laboratories to manufacture gunpowder and other products for the Confederate army.

Soon after the war he reached St. Louis, where he assisted in establishing what is now the Missouri Medical College, and in which he held the chair of chemistry until the time of his death. He also held for eleven years the professorship of chemistry in the St. Louis College of Pharmacy.

Dr. Curtman became a member of the Committee of Revision of the U. S. Pharmacopœia in 1890. His contributions to science have been quite numerous, most of his later researches being on subjects connected with pharmacopœial revision. His most popular work was his "Lessons in Qualitative and Volumetric Chemical Analysis," which included Dr. F. Beilstein's "Lessons in Qualitative Analysis." This work is now in its fourth edition. Another valuable work was that on "Uses, Test for Purity and Preparation of Chemical Reagents," which required for its production a great amount of patient research on the part of the author.

Dr. Curtman died on April 22, 1896, after ten days' illness.

The St. Louis College of Pharmacy has recently adopted the following resolutions of respect:

Resolved, That it is with deep sorrow that we record the death of Dr. Chas. O. Curtman, who was for eleven years a member of this Association, and who, in the chair of chemistry, was one of its most successful teachers and did much in building up the reputation of the College.

Resolved, That in him whose loss we lament we recognize one who has wielded a wide influence, because of his ability and aptness in his chosen vocation; one who has done much to disseminate knowledge, awaken thought and encourage the scientific spirit.

Resolved, That we recognize with pride the work in medical and pharmaceutical chemistry which has given him an international reputation, and which we, as fellow-citizens of St. Louis, in a small measure, share with him.

Resolved, That while the industry, patience and thoroughness with which he has pursued his investigations in many branches of science has challenged our admiration, we also bear testimony to the many good personal qualities which have attached him to us as a friend.

Resolved, That these resolutions be spread upon the records of the College, be furnished the pharmaceutical press for publication, and that an engrossed copy be transmitted to the family.

CHAS. GIETNER, *President.*
J. C. FALK, *Secretary.*

NOTES AND NEWS.

Prof. Francis Hemm has been elected to fill the position of professor of chemistry in the Missouri Medical College, St. Louis, vacant on account of the death of Dr. Charles O. Curtman. Professor Hemm at present holds the position of director of the pharmaceutical laboratories in the St. Louis College of Pharmacy.

Dr. B. H. Paul and A. J. Cownley have recently contributed an article on the comparative value of *Brazilian and Columbian ipecacuanha.*[1]

The question as to the relative medicinal value of the two kinds of ipecac now met with in commerce has acquired greater importance since the pharmacological observations conducted by Dr. Wild[2] have shown that there is a well-marked difference between the effects produced by the two bases, emetine and cephaeline, which are present in these drugs in different relative proportions.

According to Dr. Wild's observations, emetine is a good expectorant, but cephaeline does not appear to be equal to it in this respect, while on the contrary, cephaeline is undoubtedly superior as an emetic.

The authors determined the mixed alkaloids by extracting the drug with amylic alcohol, removing them from this solvent with dilute sulphuric acid, adding to the latter excess of ammonia and shaking out with ether. The alkaloids were separated by dissolving in hydrochloric acid, adding sodium hydrate in excess and shaking with ether.

The separated ether solution was acidified and again treated with sodium hydrate, this operation being repeated until the cephaeline was sufficiently removed, which was ascertained by the absence of precipitate on adding ammonium chloride to the alkaline liquor. After the separation was effected, the ether solution of emetine was evaporated and the residue titrated with semi-normal hydrochloric acid (1 c.c. semi-normal HCl = 0·124 emetine).

From the alkaline soda liquid cephaeline was precipitated, by the addition of ammonium chloride, and shaken out with ether. The residue left after evaporating the ether was titrated as above (1 c.c. semi-normal HCl = 0·117 cephaeline).

From a careful examination of selected samples of Brazilian and Columbian ipecac, the authors have obtained the following results:

	Brazilian.		Columbian.
	Root.	Stem.	
Emetine	1·45	1·18	0·89
Cephaeline	0·52	0·59	1·25
Third base	0·04	0·03	0·06
Total	2·01	1·80	2·20

[1] *Pharmaceutical Journal*, **56**, 321.

[2] *Pharmaceutical Journal*, **55**, 435.

THE AMERICAN
JOURNAL OF PHARMACY

JULY, 1896.

ON THE PREPARATIONS OF STROPHANTHUS.

By Horatio C. Wood, M.D., and William S. Carter, M.D.

Report of Research Committee on Pharmacodynamics, of the Committee o Revision of the United States Pharmacopœia.

The United States Pharmacopœia of 1890 recognizes only one preparation of the important drug strophanthus, namely, the tincture. It is, however, in practice, very often desirable to give strophanthus with other drugs in pill form, and the present research was made to test the activity of the best commercial strophanthin, and also of an extract. *A priori*, there is no reason for supposing that the extract will not be an effective preparation; but in order to determine the question positively, we have made, in the Physiological Laboratory of the University, a series of experiments with the drug upon mammals. The extract was made by Dr. Charles Rice, by evaporating the tincture. Of it he says:

Extract of Strophanthus.—Each 1 gramme of this corresponds to 4·127 grammes of strophanthus seed, or to 82·5 c.c. of the official tincture. I did not attempt to bring the extract to a definite weight, bearing a simple proportion to the crude drug or the tincture, since it is just as easy, or rather easier, to weigh out such a quantity of the extract as will make a solution of any desired strength.

The following are the experiments made with this extract. In each of them a solution of the extract of strophanthus was made, 0·1 gramme in 1,000 c.c. of water, given by injection into the jugular vein.

Experiment 1.—Dog; weight, 8·6 kilos.

Arterial pressure, 92; 5 c.c. were given. The arterial pressure rose in one minute 5 mm., when 5 c.c. more were injected. In one

minute, pressure rose 5 mm. more, when 10 c.c. were administered, followed in one minute by a rise of 7 mm., making 17 in all. Nine minutes later, the pressure had fallen almost to the normal, when 20 c.c. were given in the course of one minute, and the pressure began to rise. Three minutes later, it was 18 mm. above the normal.

Experiment 2.—Dog; weight, 14 kilos.

Arterial pressure, 146; 5 c.c. given; no distinct effect. In three minutes, 5 c.c. more given with no distinct effect; in seven minutes, 8 c.c. more given, making 18 c.c. in ten minutes. One minute later, rise of 6 mm.; one minute later, further rise of 14 mm., making 20 mm. above the normal. Two minutes later, pressure 22 mm. above the normal. Seven minutes later, 10 c.c. were given, when the pressure began to fall rapidly, and two minutes later was 74 mm. below the normal. The dog died thirty seconds after this, of cardiac arrest.

Experiment 3.—Dog; weight, 8·6 kilos.

Arterial pressure, 146; 3 c.c. given. Three minutes later, pressure 20 mm. above the normal; five minutes after first injection, 5 c.c. given; three minutes later, the pressure was 32 mm. above the normal. Five minutes after this, the pressure was 10 mm. above the normal. Another 5 c.c. given; pressure rose in one minute to 46 mm. above the normal; half a minute later, was 52 mm. above the normal; one minute later, was 56 mm. above the normal. Dog lived for twenty-four minutes after this.

Experiment 4.—Dog; weight, 5·3 kilos.

Spinal cord cut so as to produce vasomotor paralysis.

Arterial pressure, 22; 3 c.c. in one minute put up the pressure 10 mm.; a subsequent injection of 3 c.c. more was followed by no rise of pressure, which was steady 8 to 10 mm. above the normal for seven minutes. Another 3 c.c. was given; this produced a steady pressure of from 10 to 12 mm. above the normal. In thirteen minutes, another 5 c.c. was given, followed by a rise in half a minute of the pressure to 22 mm. above the normal. This rise amounted to 50 per cent. of the whole pressure, which had been 22 mm. (after section of the cord). Dog died shortly afterwards.

An examination of these experiments will show that the extract

of strophanthus is an active preparation. The fact of the great percentage of rise in the last experiment, when the spinal cord had been previously cut and the vasomotor system paralyzed, is very interesting as an evidence of the little action which this drug has upon the vasomotor centres, as compared with what it has upon the heart and vessel walls. A comparison of our experiments will also show the great difficulty there is in testing drugs by comparative experiments upon the lower animals, the amount of rise in individual cases produced by the injection being entirely out of proportion to the relation between the dose given and the weight of the animal.

If the extract should, as we believe it ought to be introduced into the United States Pharmacopœia, it is evident that it should be made by a process which will give a fixed product for the amount of drug used. Every practitioner of medicine, in thinking of strophanthus therapeutically, thinks not of the drug itself, but of the tincture. Ordinarily the doctor has no knowledge how much the tincture of strophanthus represents, his unit of work in his own mind being 5 or 10 minims of the tincture. The extract should therefore bear relation to the tincture. It would not take many pharmaceutical experiments to determine what proportion of extract the official tincture would yield on evaporation, and it would be pharmaceutically very easy to add to this extract so that the one-eighth or the one-fourth of a grain, as the case may be, would represent 5 minims of the tincture.

STROPHANTHIN.

We have also made a series of experiments with commercial strophanthin, furnished us by Dr. Charles Rice.

The solution used in experiments 1 and 2 was made by dissolving 0·1 gramme of the strophanthin in 100 c.c. of water. 1 c.c. of it, therefore, represented 0·001 gramme of the strophanthin, or 1 milligramme. The solution was always thrown directly into the jugular vein.

Experiment 1.—Dog; weight, 20·5 kilos.

2 c.c. of the solution caused a rise of 65 mm. in four minutes, which was maintained for eight minutes, when 2 c.c. more of the solution were given, followed by a fatal arrest of the heart's action in one and one-half minutes.

Experiment 2.—Dog; weight, 15·5 kilos.

1 c.c. elevated the pressure 14 mm. in one minute, when a second 1 c.c. was given; the result being that in seven minutes the pressure was increased 62 mm. above the normal. After this, 1 c.c. was administered, followed by cardiac arrest in nine minutes and ten seconds.

Experiments 3, 4, 5, 6, 7, were made with a solution of 0·1 gramme in 1,000 c.c. of water; of this solution, therefore, 10 c.c. equalled 1 milligramme.

Experiment 3.—Dog; weight, 7 kilos.

Injected into the jugular 2 c.c. Pressure in five minutes rose to 18 mm.; eight minutes after first injection, a second of 3 c.c.; two minutes after, a third of 4 c.c. Two minutes later, pressure was 40 mm. above the normal; then began to fall and continued to fall, although an injection of 5 c.c. was given, and five minutes later another of 3 c.c. One minute after the last injection the heart stopped.

Experiment 4.—Dog; weight, 17 kilos.

5 c.c. given. One minute later, pressure rose 28 above the normal; slowly fell, however, so that ten minutes after the injection the pressure was at the normal. Another 5 c.c. given, and three minutes later 8 c.c. Pressure began to rise, and in two and one-half minutes after the last injection it was 43 mm. above the normal. One minute later it was 52 above the normal; five minutes later was 28 above the normal, and continued so for fifteen minutes, when another 5 c.c. was given. Three minutes after this, another 5 c.c. During the next six or seven minutes pressure was 30 to 40 above the normal; it then began to fall, the fall being accelerated by a further injection of 10 c.c., followed by death in three minutes, from cardiac arrest.

Experiment 5.—Dog; weight, 8·5 kilos.

Injected into the jugular 10 c.c., given slowly; one minute later, pressure up to 10 mm.; 10 c.c. given; pressure immediately rose 15 mm., and stayed so for three minutes. Two minutes later pressure at 6 mm. above the normal, remaining so for another minute, when it fell to the normal, and 10 c.c. was given. One minute later, there being no rise of pressure, another 10 c.c. was given. Pressure for the next twelve minutes after this was from 10 to 15 above the

normal. Another 10 c.c. given; half a minute after, the pressure was 18 mm. above the normal. It then began to fall and continued to do so.

Experiment 6.—Dog; weight, 14 kilos.

Injected into the jugular. Pressure very high; 5 c.c. given; thirteen minutes after, another 5 c.c. given; eight minutes later, 8 c.c. given. During the whole of this time the pressure was below the normal—from 10 to 20 mm. After the third injection the pressure began to rise, and in three minutes was 15 above the normal, and stayed at 15 to 20 above the normal for two minutes longer, when it began to fall, and, three minutes later, was below the normal. 10 c.c. given, followed by rapid fall of pressure, and death from cardiac arrest in three minutes.

Experiment 7.—Dog; weight, 8·5 kilos.

Injected into the jugular. Pressure very high; 3 c.c. given; pressure rose immediately. In three minutes was 20 above the normal. Two minutes later, 5 c.c. given. During the next nine minutes the pressure varied considerably, but was, on the average, 15 above the normal. 5 c.c. given, pressure rose in a minute to 30 above the normal. During the next nine minutes the average was 50 above the normal. 5 c.c. then given, and in five minutes the animal died from tetanus.

It is not necessary for our present purpose to discuss these experiments in detail; they are sufficient to show that the commercial strophanthin, as put upon the market by manufacturers of the first-class, is an extremely active substance.

As long ago as 1888, Rothziegel and Koralzewski reported the results of the use of strophanthin in forty-four cases of disease. They state that the influence of very small doses, 0·0002 to 0·0003 gramme, is distinctly perceptible in an increase of the force of the pulse in from five to ten minutes; but that usually in cardiac cases the disappearance of the irregularity of the heart's action was not perceived until the second or third day of treatment; that when there was dyspnœa from cardiac disease, the difficulty in breathing disappeared very rapidly. No local irritation was, in their experience, produced by the hypodermic injections of as much as 5 decimilligrammes of the strophanthin. They ordinarily gave from 1 to 3 milligrammes

in the twenty-four hours; in one case they gave 5 milligrammes for eight days, without any bad results. In two cases, however, the daily use of 3 milligrammes for two weeks caused reduction of the pulse-rate to 48 per minute, without any other accompanying symptoms. They reached the conclusion that the strophanthin was a good substitute for the tincture of strophanthus.

In looking over the records of our experiments, it will be seen that the activity of the strophanthin itself was much more marked in raising the arterial pressure than that of the extract, so that confirmation is afforded of the conclusion of Rothziegel and Koralzewski—that strophanthin is a superior preparation of the drug.

We believe, therefore, that the Pharmacopœia should recognize the active principle of strophanthus, and give appropriate tests for its purity.

PHYSIOLOGICAL LABORATORY,
UNIVERSITY OF PENNSYLVANIA, May, 1896.

AN EXAMINATION OF SOME RECENT SUGAR REACTIONS.

BY FREDERICK W. HAUSSMANN.

According to the statements of prominent investigators, physiological glycosuria is an established fact.

The researches of Emil Fischer on carbohydrates have also found application in the analysis of urine, and the above statement has been strengthened by the fact that, according to the researches of Schilder, the precipitates obtained from normal urine, after treatment with lead chloride and ammonium hydrate, always respond to the phenylhydrazine reaction. It must be regretted that this delicate reaction for glucose is not easily applicable, as the determination of the melting-point of the compound formed is an absolute necessity, and, therefore, excludes a rapid examination of urine.

The statement is frequently made that temporary glycosuria is of little significance. The influence of food, muscular exercise, etc., are known to produce this effect. Individual tendencies are also known to vary under such conditions, and, if such influences are brought to bear upon certain subjects, a temporary glycosuria is of decided prognostic value.

The above deduction can be made from the statement of See, who

regards all individuals whose urine, one hour after the consumption of 150 grammes of wheat bread, shows an increased amount of inverted sugar, as future diabetics.

If this statement is correct, the presence of glucose in urine, under such conditions, is of more than passing importance.

Unfortunately, the detection of small amounts of glucose in urine is not an easy matter.

Other urine constituents interfere, and a test, absolutely trustworthy and easily applied, remains as yet to be found.

The medical and pharmaceutical press frequently publishes new, or modifications of old, sugar reactions, but on thorough trial most are found defective.

The copper reactions still appear to possess the confidence of most urine analysts, and a number of modifications have been suggested.

The fact that some coal-tar dyes in alkaline solution are changed to leuco-derivatives, colorless compounds in the presence of glucose, is taken advantage of in examining diabetic urine.

The two most prominent are Wender's methylene blue and Crissler's safranine tests.

The former has been stated to be affected by uric acid, and consequently cannot be regarded as possessing any advantage over Fehling's solution.

The rapid absorption of oxygen by the reduced liquid, tending to restore the original blue color, is another feature which detracts from the value of this test.

The Safranine Test.—Brief mention was made of this reaction in the January Pharmaceutical Meeting in connection with chrysophanic acid urine.

Safranine occurs in commerce as a brown powder, soluble in water and alcohol.

Technically it is used for dyeing cotton red, with a mordant of tannin and tartar-emetic.

It is stated that, on the addition of an alkali, safranine solution will not precipitate immediately, but, on standing some time, more or less precipitation will take place.

The test is applied as follows (reprinted from AM. JOUR. PHARM., Vol. 68, p. 94):

Equal measures of urine (2 c.c.), of normal NaOH or KOH solu-

tion and a solution of safranine, 1 part to 1,000 parts of water, are mixed.

The mixture is heated in a test tube, avoiding agitation as much as possible, till freely boiling. If the urine contains more than 0·1 per cent., the liquid is decolorized, otherwise the red color remains intact or is only partly destroyed. If the color is destroyed, the test may be repeated with twice or three times the volume of the safranine solution, each 2 c.c. of which roughly represents 0·1 per cent. of the glucose.

As stated, the test depends upon formation of a colorless leuco-derivative.

On diluting such a decolorized mixture, the red safranine color is again restored, also by vigorous agitation of the test tube in the the case of a small sugar percentage.

Albumin, by prolonged boiling, will also act like glucose, and must therefore be first removed.

The following statement accompanies the above directions:

Any discharge of color in the non-presence of albumin in the urine may be set down as being due to sugar.

The test is stated to remain unaffected by uric acid, creatine, creatinine, chloral, chloroform, hydrogen peroxide or salts of hydroxylamine.

The writer would extend this list to the following compounds, which were subjected to the safranine test in 10 per cent. aqueous solutions as follows:

Two cubic centimetres each of the solution, normal KOH solution, and the given strength safranine solution were heated to boiling in the usual manner. Acetone, antipyrine, chloral hydrate, potassium chlorate, tannin, gallic acid, pyrogallol, resorcin, hypophosphites, oxalates, salicylates, peptone of digestion, cane sugar, sodium phosphate, piperazine, slight action upon egg albumin.

REMARKS.

Acetone is not affected in subjecting it to the safranine test.

This is an advantage over Fehling's solution, the latter being slightly reduced.

With tannin, the safranine mixture turns very dark.

Milk sugar has the same action as glucose.

Action upon the Urinary Secretion.—Normal urine, when unaf-

fected by the safranine test, will not differ in its action when allowed to undergo ammoniacal decomposition.

In the examination of albuminous urine, the safranine mixture is in some instances decolorized only after prolonged boiling. The writer has, however, found in a number of instances that the urine, after complete separation of albumin by coagulation, will decolorize safranine solution as readily as the original urine.

As pointed out, peptone exerts no reducing action upon this test.

The fact that milk sugar behaves in a manner similar to glucose must be remembered, when examining the urine of nursing women.

Action upon Abnormal Urine.—As in the case of the copper tests, the question arises—does urine, passed after the administration of certain drugs, possess any action upon the safranine test?

If such should be the case, the result obtained must be regarded with as much conservatism as the reduction of Fehling's solution under like conditions.

To determine this, the writer subjected a number of specimens of urine, some apparently normal, and others which had been passed after internal administration of certain remedies, to the action of the safranine test.

He has found in almost every instance that, whenever Fehling's solution was strongly reduced by such specimens, the safranine test was also affected in a similar manner, to a greater or less degree.

The following is the result of an examination of forty-seven specimens of urine obtained from various sources.

Twelve specimens gave no reaction whatever. Most of these were normal, examined for insurance, which gave little or no reaction with Fehling's solution.

The other thirty-five specimens all reacted more or less to the safranine test.

Five samples had a diabetic history; one contained milk sugar.

Of the rest, the history was either not known or they were passed after the administration of certain drugs.

The administration of the following drugs was recorded:

Salol (6 cases), salicylates (7 cases), phenacetine (3 cases), oil of turpentine (3 cases), antipyrine (3 cases), creosote (5 cases), trional (1 case), piperazine (1 case).

Of the last-mentioned drug, one sample of urine was obtained, which did not respond to the safranine test.

From the above results, the deduction must be made that such urines, presumably glycuronic, affect the safranine as well as the copper test, acting like a small amount of glucose.

But the statement that any discharge of color by a sample of urine freed from albumin may be set down as being due to the presence of sugar, is not allowable in the case of such urines.

A suspicion of diabetes can, however, be entertained, if successive additions of the safranine solution are decolorized by the urine.

The question may be raised in these cases whether the reducing substance is a glycuronic compound or a small percentage of glucose.

In all doubtful cases, such urine was precipitated by basic lead acetate, the excess of lead removed by diluted sulphuric acid.

If glucose was present, the application to the filtrate of either the alkaline copper or the safranine test readily revealed its presence.

It may also be questioned if small quantities of glucose are not precipitated and removed by this treatment.

Various trials, made by the writer, showed that urine containing 0·1 per cent. of glucose can be subjected to the lead treatment and still reveal the presence in the filtrate to the copper or safranine tests.

Further dilutions, however, responded but feebly or entirely in the negative.

Milk sugar, substituted for glucose in these determinations, gave the same results.

For the quantitative estimation of sugar in diabetic urine, the safranine test does not give accurate results.

It has been stated that the discharge of color of each 2 c.c. of the safranine solution, 1 part to 1,000, corresponds roughly to 0·1 per cent. of sugar.

In working on this basis, the difficulty lies in determining the end of the reaction, when the mixture is required to assume the original red color before boiling.

In urine containing a large sugar percentage, dilution is necessary.

The writer has followed the practice of retaining a portion of the original mixture, and comparing with the boiled portion.

The fact that the end reaction, by the discharge of the blue color, can be readily observed forms one of the great advantages of Fehling's solution over the safranine test in quantitative estimations.

The Cupric Salicylate Test.—A number of modifications of the copper test have been proposed, the most recent of which is the following solution:

	Parts.
Cupric sulphate	2
Sodium salicylate cryst	2
Sodium carbonate	8

Distilled water, a sufficient quantity to make 100 parts.

The filtered solution has a dark green color, and the reducible constituent is stated to be cupric salicylate.

On boiling the liquid in a test tube, the precipitate formed is from gray to black, coating the sides of the tube.

If to 5 c.c. of this solution a few drops of diabetic urine are added and boiled, the precipitate will be dirty green.

On the further addition of urine, the precipitate will be of a yellow color.

The following directions are given:

Equal parts of the copper test liquid and urine are heated together to the boiling point, until a precipitate is formed.

If the same is gray or black, no sugar is present.

The writer subjected this test to a number of examinations, with a view of determining its delicacy, as well as its action upon certain glycuronic urines.

A number of specimens of normal urine, examined as directed, gave precipitates which varied in the shade of green.

The important point in this reaction seems to be in the appearance of a yellowish or yellowish-green tint in the liquid overlying the precipitate in the case of diabetic urine.

Urine containing ·25 per cent. of glucose will, if the proportions of urine and test liquid are as directed above, show a complete reduction by prolonged boiling.

Urine containing ·125 ($\frac{1}{8}$) per cent. of glucose will not completely reduce, but gives a yellowish-green supernatant liquid.

Samples containing ·063 ($\frac{1}{16}$) per cent. will not reduce the solution, and the color of the supernatant liquid will but slightly differ from that produced with perfectly normal urine.

The delicacy of the reaction may be placed between 0·1 per cent. and 0·125 per cent. of glucose.

Milk sugar reacts in the same manner as glucose, but the point of delicacy must be placed at a higher percentage point.

Reaction upon Glycuronic Urines.—An investigation was also made to determine the effect of urine passed after the administration of certain drugs upon this test.

Some specimens, such as creosote and salicylate urine, will, on boiling, assume a brown-black color, which, on dilution with water, show an almost complete absence of green.

The precipitate is, in such cases, gray or black.

It has, however, been observed by the writer that a subsequent addition of ·5 per cent. to 1 per cent. of glucose to such urine will give no evidence of reduction, the dark mixture obscuring the physical evidences.

A specimen of creasote urine, to which an addition of 0·5 per cent of glucose was made, gave, on boiling with an equal volume of the test liquid, a gray-black precipitate with a red-brown supernatant liquid. Comparison with the sugar-free sample, treated in a similar manner, showed no material physical variations.

The precipitation of Cu_2O in the saccharine sample was completely obscured.

Worm-Mueller's Modification of Fehling's Test.—The researches of several investigators have led to the determination of the various temperature points, at which the reduction of Fehling's solution takes place, when acted upon by other reducing urine constituents besides glucose. Those of primary importance are uric acid and creatinine.

Glucose reduces Fehling's solution at a temperature of from 60° to 70° C., the same being approximately the case also with milk sugar.

The reduction produced by uric acid is at this point feeble, the same taking place only at a temperature close to the boiling point.

In the case of creatinine, slight reduction is stated to take place between 60° and 70° C., but only completely between 90° and 100° C.

In normal urine its reducing power is, however, regarded as being insignificant.

These temperature variations are taken advantage of in the Worm-Mueller modification.

As given by the author, the test is applied as follows:

Solutions of cupric sulphate of 2·5 per cent., and of 10 per cent. of potassium and sodium tartrate in 4 per cent. NaOH or 5·6 per cent. KOH, are prepared. 1 c.c. of the copper solution is mixed with 2·5 c.c. of the alkaline Rochelle salt solution. 5 c.c. of the urine to be examined are employed.

Both liquids are heated at the same time to the boiling point, the boiling simultaneously interrupted, and after standing 20 to 25 seconds, no sooner, mixed and again allowed to stand.

The temperature of the liquids at the point of mixing is stated to be about 80° to 85° C., but will rapidly fall to 60° and lower.

According to the statement of the author, this procedure will produce the same effect as if the mixture is heated to 60° or 70° C.

If in 5 or 10 minutes no cuprous oxide is precipitated, the test is repeated with an increase of 0·5 c.c. of the copper solution, the alkaline mixture remaining as before. The copper solution may in this manner be increased until about 4 c.c. are taken.

If glucose is present, the oxide will be suspended throughout the liquid in the form of a dirty yellowish-green cloud.

A phosphate deposit, which may possibly obscure small amounts of the oxide, will soon sink to the bottom.

The author states that 0·025 per cent. of glucose may be detected in the urine by this method.

NOTES.

A. Jolles (see Proceedings of the A. Ph. A., 1895, p. 780) places the delicacy of this test at 0·08 per cent.

In a number of determinations the writer has obtained results which correspond with the statement of Worm-Mueller as to the percentage found.

But in several instances, while examining the urine of gouty patients or of those passed after the administration of piperazine, partial reduction of the test solution was found to take place.

As with Fehling's solution, this test is also affected by glycuronic urines.

After the administration of creosote or sodium salicylate, the

eliminated urine will turn the blue color of this test liquid to red.

In a case of sulphonal urine, a similar effect was also noticed.

As given by the author, this test is too tedious.

The writer employs freshly prepared Fehling's solution, following the direction of Worm-Mueller in the observation of time and other points.

5 c.c. each of Fehling's solution and of urine are taken.

If the urine contains 0·1 per cent. of glucose, the effects stated in the Worm-Mueller reaction will take place in less than one-half minute.

Urine containing 0·05 per cent. will deposit the oxide, when undiluted Fehling's solution is employed, on ten to fifteen minutes' standing.

With urine containing 0·025 per cent. of glucose, dilution of Fehling's solution is necessary.

On making the proportion 2 c.c. of the copper solution and 3 c.c. of water, taking 5 c.c. of the urine, the above sugar percentage in urine responds quite readily.

SOLID EXTRACTS AND THEIR STANDARDIZATION.[1]

By Charles H. LaWall.

With each succeeding revision of the United States Pharmacopœia since 1860 there has been a marked improvement in the various classes of Galenical preparations. The processes for the individual tinctures and fluid extracts have been subjected to criticism and subsequently altered when it was found necessary, so that, at the present time, an official process, when carefully adhered to in all of its details, will produce a satisfactory preparation.

It is particularly noticeable that the solid extracts have not shared, to any great extent, in the improvements of the past few decades, but that the same lack of uniformity exists at the present time as was formerly the case. The pharmacist of to-day, when he goes to the shelf for a jar of solid extract to aid him in compounding a prescription, is under the same disadvantage as formerly, in not certainly knowing whether he will be able to pour out the

[1] Read at the meeting of the Pennsylvania Pharmaceutical Association, June 16, 1896.

required quantity, or whether it will be necessary to use a hammer and a cold chisel to get it out of the jar. The definition *pilular consistence* is now, and always will be, subject to as many different interpretations as there are pharmacists. This difficulty (which will never be entirely overcome) is of minor importance to the real one, *i. e.*, the lack of uniformity in strength, when compared with the drug itself. This has been referred to frequently, but has not yet been remedied.

It is a matter of grave importance when we realize that the quantity of extractive matter obtained from a drug bears no definite ratio to the percentage of its active constituents or to its medicinal efficacy, but is influenced almost solely by the degree of dilution of the alcoholic menstruum employed in the percolation of the drug. An unscrupulous manufacturer can obtain twice as much solid extract from a given drug as one who works according to the Pharmacopœia. His profits, therefore, are doubly great, and it matters little to him that his preparation is deficient in medicinal value, since there is no standard to which his product must conform.

Among the leading manufacturers of the present time the watchword is standardization, and, by its aid, is being developed a uniformity in many preparations even when made from drugs of varying quality. There has been much said both for and against this movement, but its opponents are few, and by this time must realize that it is neither an advertisement nor a fad, but is the natural outcome of the evolutionary forces that have long been at work in the science of practical pharmacy, and, in the cases of opium, cinchona and nux vomica, there are requirements in the present Pharmacopœia both for the drugs and some of the preparations made from them. Since the last revision of that important work, however, many additional drugs have been investigated, and, at the meeting of the American Pharmaceutical Association in 1895, the Committee on the Revision of the Pharmacopœia recommended that standards and processes of assay be adopted also for coca leaves, hydrastis and pilocarpus.

If convenient and appropriate standards be adopted for the solid extracts of such drugs as have principles which are easily estimated, the remaining difficulty would only consist in the preservation of the extracts so as to retain the consistence which they possessed at the time of manufacture. When about 4 or 5 per cent. of glycerin

is added to the nearly finished extract, it suffers but slight alteration in consistence even when kept for several years; of course, it must be kept tightly covered, probably one-half of the deterioration of solid extracts being due to neglect of this precaution, in which case loss of moisture causes the extract to become hard and brittle and produces a corresponding alteration in strength.

A list has been prepared of the average yield of solid extract obtained in actual practice from those official drugs to which standardization might easily be applied; to this has been added, in each case, the average percentage of alkaloid present in the drug, and the standard to which the solid extract should conform in alkaloidal content.

Extracts.	Average Per Cent. of Extract Obtained.	Average Per Cent. of Alkaloid Present in the Drug.	Percentage of Alkaloid Required in a Solid Extract of Standard Strength.
Aconite root	19	0·50	2·50
Belladonna leaves, alcoholic .	20	0·40	2·00
Cinchona	26	2·50[1]	10·00[1]
Colchicum root	25	0·50	2·00
Conium	28	0·50	1·75
Hyoscyamus	20	0·18	0·90
Physostigma	5	0.20	4·00
Stramonium seed	20	0·35	1·75
Nux vomica	Standard has already been adopted.		
Opium	Standard has already been adopted.		

[1] Percentage of quinine.

In aconite root the percentage of extractive, when compared with the average alkaloidal content of the drug, shows that the extract should contain about 2·50 per cent. of aconitine, estimated gravimetrically.

Extract of belladonna leaves (alcoholic) represents about five times its weight of the drug and contains about 2·00 per cent. of alkaloid, estimated gravimetrically.

Cinchona contains about 25 per cent. of extractive matter, and should, therefore, assay about 20 per cent. of total alkaloids, one-half of which should be quinine.

Colchicum root yields about 25 per cent. of extract, which should assay about 2·00 per cent. of alkaloid.

Conium fruit yields nearly 30 per cent. of extract, which should contain about 1·75 per cent. alkaloid.

Hyoscyamus contains about 20 per cent. of extract, which should yield about 0·90 per cent. of alkaloid, estimated gravimetrically.

Physostigma yields but 5 per cent. of extractive matter, which corresponds to 4·00 per cent. of ether-soluble alkaloid.

Stramonium seed contains about 20 per cent. of extractive matter, corresponding to about 1·75 per cent. of alkaloid.

The author has obtained very favorable results in practice, with the above data, in the cases of several of the drugs just enumerated.

In the *Bulletin of Pharmacy*, 1895, page 202, Professor J. B. Nagelvoort published an excellent article, in which he considered the subject of standardization from a business standpoint. In this paper, Prof. Nagelvoort objects to the use of glucose in solid extracts, and suggests the use of extract of taraxacum as a diluent for those extracts which are considerably over the standard in strength, and he also gives several examples of practical results working with belladonna leaves of varying quality. Extract of licorice and extract of gentian have also been mentioned for use in diluting, being of comparatively low cost, and practically inert. The use of gentian might be objected to upon the ground of its strong, bitter taste, which would mask the characteristic taste of most drugs, and render identification difficult. Another method, which the author would like to suggest for further experimenting on this subject, is as follows:

Percolate a portion of the drug with a menstruum about 5 or 10 per cent. lower in alcoholic strength. This will in most cases ensure a larger yield of extract, of correspondingly lower strength. This preparation could be kept on hand and used as required in cases where dilution becomes necessary. By this method no principles

foreign to the drug are introduced, and it becomes a simple problem for calculation in order to ascertain the proportions of the weaker and the stronger extracts to be mixed to produce an extract of standard strength.

In the case of some solid extracts (such as belladonna) which contain a large amount of chlorophyll, the difficulty is often experienced of having that substance separate out in lumps or clots as the extract nears completion. It can rarely, if ever, be thoroughly incorporated so as to make a perfectly homogeneous extract; and while it is possible to remove this separated chlorophyll without impairing the medicinal activity of the preparation, the extract does not then possess the color which is characteristic to it, and, in the case of extract of belladonna, resembles the preparation made from the root rather than that made from the leaf.

This difficulty can only be obviated with certainty by evaporating the percolate from the drug under reduced pressure with continuous stirring, which is impracticable for manufacturers of small quantities.

The powdered extracts may be made to conform to fixed standards in the same manner as the solid extracts, and present indications show that but a short time will elapse until standardized extracts, both solid and powdered, will be the rule rather than the exception.

Changes of a radical nature must necessarily be slow in order to be effective. The introduction of the class of preparations known as abstracts into the 1880 Pharmacopœia was too abrupt. They were but little used, and were dismissed from the last revision of that work. This was not due to lack of efficiency in any respect, for their uniformity rendered them preferable to the powdered extracts, which they closely resembled, and the use of which they did not seem to influence in the least; yet, if but one or two of the more important abstracts had been admitted at first, it might have paved the way for the permanent introduction of one of the most desirable classes of preparations the Pharmacopœia has ever contained.

A list is given below of the yield of solid extract obtained from a number of drugs, both official and otherwise, working upon a large scale in practice. These figures may serve as additional data for other workers in the same line, and the author hopes that the subject of the standardization of the solid extracts will be given

careful consideration by all who are interested in the scientific progress of practical pharmacy.

Drug.	Per Cent. of Extract Obtained.	Drug.	Per Cent. of Extract Obtained.
Cannabis indica	13	Buchu	14
Cimicifuga	30	Cornus florida	7
Digitalis	20	Fucus vesiculosus	26
Ergot	14	Cubeb	20
Gentian	35	Colchicum seed	16
Licorice, purified	55	Damiana	11
Jalap	27	Ignatia amara	19
Juglans	12	Sumbul	28
Leptandra	27	Rumex	40
Quassia	3·5	Viburnum prun.	15
Rhubarb	30	Senega	46
Taraxacum	35	Cotton-root bark	10
Uva ursi	30	Calumba	17
Logwood	5	Valerian	20
Xanthoxylum	6	Viburnum opulus	23
Gelsemium	10	Scutellaria	35
Conium leaf	30	Calendula	30
Hamamelis	25	Jaborandi	25
Triticum	18	Grindelia robusta	20
Kava Kava	7	Colchicum (acetic)	25
Pulsatilla	24	Scoparius	17
Serpentaria	10	Rubus	25
Chirata	15	Salvia	25

305 CHERRY STREET, PHILADELPHIA, PA.

THE EXAMINATION OF POWDERED GAMBOGE.[1]

BY E. G. EBERHARDT.

In the last revision of the Pharmacopœia and also in the preceding one, under the heading "Cambogia," there follows, after the description of general properties, this statement: "Boiled with water, gamboge yields a liquid which, after cooling, does not become green with iodine T. S. (absence of starch)." This test is sufficiently delicate to disclose the presence of considerably less than 1 per cent. of starch, and although good pipe gamboge will generally meet this requirement, an experience extending over several years has failed to discover a powdered gum that would do the same. There always seems to be present in the latter a small amount—1

[1] Read at the meeting of the Indiana Pharmaceutical Association, June 3, 1896.

per cent. and less—of starch, a quantity too small to be classed as an adulteration, and yet too large to be justified by the Pharmacopœia. This authority recognizes and describes only pipe gamboge, but by far the larger number of druggists buy and use the powder. So it happens that the officially described article is not the one in general use.

How this trace of starch finds its way into the drug we have not been able to determine. A well-known firm of New York drug millers being asked about the matter replied that their gamboge was powdered from block or mass and broken pipes, upon their own premises, under their own supervision, and was strictly pure. The only explanation they could offer for the presence of starch was that block or mass gamboge was moulded in forms made from, or lined with, rice straw, of which a very little becomes mixed with the gum, and certain qualities are occasionally mentioned in London market reports as blocky, broken and ricey. They state, however, that they have never observed the latter in the American market.

Another possible explanation is that the mills used in grinding contained remnants of some starchy drug, and were not thoroughly cleaned before being used upon gamboge. However this may be, it is certain that a trace of starch should not condemn a drug otherwise pure, and if a starch-test is applied, it should be of such a nature as to distinguish between small and excessive amounts. Far better it would be to require the presence of from 75 to 80 per cent. of resin, as this is the active and valuable portion.

In order to ascertain approximately how much starch powdered gamboge contains, a convenient quantity was exhausted with ether, the small amount of residue dissolved in hot water and cooled, when, upon adding a drop of iodine solution, a faint blue color developed, showing the presence of only traces of starch. This same sample gave a distinct green color under the conditions of the official test.

Gamboge resin (cambogic acid) dissolves completely in solutions of the caustic alkalies, and is precipitated apparently unchanged upon the addition of excess of acid. Starch also dissolves in solution of caustic alkali. Such solution, when acidulated with hydrochloric acid, shows cloudiness, but no perceptible precipitate. If this acidulated liquid is filtered through paper, the filtered liquid gives no reaction for starch, but if simply strained through absorbent cotton, the

liquid collected will contain an abundance of starch. Upon these facts the following test is based: in 5 c.c. of potassa solution, 1 gm. of powdered gamboge is dissolved with stirring; then 45 c.c. of distilled water are added, and lastly an excess of hydrochloric acid, the whole being stirred until uniformly of a bright yellow color. The thin magma so obtained is poured upon a pellet of absorbent cotton loosely inserted into the neck of a small funnel. The almost colorless liquid which drains off is tested with a drop or two of iodine solution. If starch is present in quantities larger than 2 per cent., a dark blue color or precipitate is immediately produced.

Commercial powdered gamboge generally gives a greenish tinge, gradually developing a faint blue color.

Pure gamboge, with 1 per cent. of starch or flour, gives a faint blue, becoming darker on standing and depositing a slight precipitate.

Two per cent. of starch gives immediately a decided blue, and, on standing a few hours, some precipitate.

Five and ten per cent. of starch give almost immediately decided precipitates of iodide of starch.

Five per cent. and less of curcuma gives pronounced starch reactions.

Any powdered gamboge which, by this test, gives immediately a dark blue color or precipitate, should be looked upon with suspicion. But even if the drug were perfectly free from starch, it might still be grossly adulterated. So the only criterion of its value is the presence of the proper amount of resin. What the remainder consists of is medicinally of no importance, so long as it is inert.

In the short table following, is given the amount of resin and residue obtained from several varieties of gamboge by treatment with alcohol. Moisture was not estimated, the material being taken in the air-dry condition:

Sample.	Pipe No. 1.	Pipe No. 2.	Pipe No. 3.	Powdered.
Residue	21·1	23·46	24·1	18·6
Resin	78·9	76·54	75·9	81·4
Starch	none	none	none	trace

The starch test, as above applied, can be used with advantage in the examination of other powdered drugs, straining being resorted to only where there is an insoluble portion or a precipitate which interferes with observation of color.

In conclusion, I would recommend that the next revision of the U. S. Pharmacopœia require that from 75 per cent. to 80 per cent. of gamboge be soluble in alcohol, and also if a test be given for starch, that it be capable of distinguishing between traces and appreciable quantities of that substance.

INDIANAPOLIS, IND., June, 1896.

ON THE IDENTIFICATION OF MORPHINE IN TOXICOLOGICAL CASES.

By J. B. NAGELVOORT.

I. It is not generally believed that many alkaloids are far more stable than they are said to be.

For obvious reasons, morphine has been selected as an example of stability under unfavorable conditions for its existence. There are not so many alkaloids to which the laymen—the public in general—have access. Morphine is one of the few usually employed to commit suicide or murder. Suicide may become important for the analytical chemist to decide upon, if a life insurance policy is involved.

Not so very long ago, Prof. David L. Davoll, Jr., of the University of Michigan, reported negative results of a research as to certain morphine reactions to be obtained from ptomaines (*Journal of the American Chemical Society*, Vol. XVI, No. 12, 1894, "Fallacies of Post-Mortem Tests for Morphine"). An investigation closely connected with positive identifications of morphine in toxicological cases.

Strychnine is a very stable alkaloid. It has been found from seven to ten months after burial. Compare Blythe, "Poisons," 1895, p. 325; W. A. Noyes, in *Journal of the American Chemical Society*, 1894, p. 108.

Coniïne was found by Otto to resist decomposition far longer than one would incline to presume. It was positively identified in a body in a high state of putrefaction, in one case in three and one-half months, in another between four and five months. (Otto, "Ausmittelung der Gifte," 1892, p. 110.)

Nicotine was found after being exposed three months to putrefying influences. (*Ante*, p. 110.)

II. The quintessence of the following lines could be written in these two sentences:

A. Morphine has been repeatedly recovered from putrefying animal matter, after fifty days' exposure to the

highly complicated action of decomposition of an animal body.

B. Tamba's experiments, that ptomaines have not any deleterious effects upon the most characteristic morphine reactions, have been fully verified. (See IV, V, VIII.)

It is, however, desirable to epitomize some notes on this subject, since the conditions requiring a sound judgment, as well as self-consciousness and ability, are seldom of greater importance than where chemical reactions have to be applied in toxicological cases. A misunderstanding of a fact or of an occurrence of any kind, lack of reasoning, lack of honesty of purpose, sometimes, may jeopardize life, liberty and the good name of any citizen.

I learn at the time that this paper is going to press that ex-Coroners *Butler* and *Bettinger*, with their two clerks, *Bird* and *Benbing*, were each sentenced to eighteen months in the House of Correction in Detroit, Mich. The quartet were convicted of conspiring to defraud the county by submitting bills for inquests which never took place.

A certain Mrs. E. McDermoth died from poisoning—was stated elsewhere. The county physician "found" traces of poison, **probably** morphine.

Conjectures and suppositions instead of observations of facts.

Another county physician reported : The potion given the baby was a tincture of opium; the custom is to shake before using, but in this instance (a poisoning by morphine) that was neglected. The drug rose to the top.

All of this testimony was paid for and no questions asked.

I refer the reader to an article in the *Bulletin of Pharmacy* for January, 1895, "le Chimiste malgré lui," where it is advocated that the pharmaceutical or analytical chemist, with a well-conducted laboratory, is the proper man in the proper place, in a toxicological case, *versus* the annual or biennial county physician, with hardly any laboratory practice.

III. It will be seen at once how important a field of labor this is, and how desirable to have all the positive evidence of our ability to recover morphine from putrefying animal matter, placed on record.

The consequence of the presence of ptomaines, in this line of work, must not be overestimated. Ogier and Ilinovici found that none of the ptomaines, isolated by ethyl ether or chloroform from a putrefied cadaver, gave the blue color reaction with ferric chloride, as morphine does. ("Real Encyclopædia der Pharmacie." By Geissler and Moeller, VIII, p. 387.) Graebener states that such characteristic reactions as we possess for morphine will succeed even in the presence of ptomaines. (Dragendorff, Ermittelung von

Gifte, 1895, p. 166.) Under a great variety of conditions I have found this to be a correct and exact observation. Special attention is therefore called, first, to the purple color reaction obtained (described below) with a freshly prepared solution of sulphomolybdate of ammonia (Fröhde's reagent); ptomaines, Dragendorff says, usually give a brown or greenish-brown color reaction; second, to the blue color reaction obtained with a dilute ferric chloride solution; third, to the blood-red color reaction obtained from the combined action of sulphuric and nitric acids, as directed in Husemann's test.

IV. Kobert states distinctly that morphine is stable in cadavers **for a few weeks.** ("Dass das Morphin sich in Leichen einige Wochen lang halten kann, ist sicher; p. 565, Lehrbuch der Intoxikationen, 1895.)

Barillot writes equally emphatically. ("La morphine résiste bien à la putréfaction; on a pu la caractériser après quelques semaines de mélange avec des matières putréfies. Barillot, Traité de Chimie légale, p. 185, 1894").

Dragendorff states: "Most of the alkaloids are more stable than is usually believed. (Dragendorff, Ermittelung von Gifte, 1895, p. 142.) Davoll's results deserve notice. This author says: "After ten days' standing in the open air and in a warm place, I recovered about 50 per cent. of the morphine added to a putrid liver;" while in his further experiment, on the isolation of ptomaines from the cadaver of a dog, no morphine reactions were obtained, or, in other words, there were no ptomaines present in the final purified product, obtained as in a usual method of analysis, capable of giving fallacious tests.

I desired to insert an excerpt of the Buchanan *case celèbre*, which was tried in New York in 1893 or 1894, but have been unsuccessful to find a report of the chemist in the case. The *New York Supplement*, Vol. 25, 1894, contains, on page 481, only a legal report. So does the *N. Y. Reporter*, Vol. 40, 1895, p. 883.

V. A practical test seems to be needed to determine how small a quantity of morphine can be isolated and identified; the sensitiveness of morphine to different reagents being well known, ⅛ grain was taken, the smallest quantity a layman could give. This was dissolved in a plate of soup. Soup was selected because I wanted to imitate volume and contents of a human stomach in natural condition.

The next step was to mix 0·050 gramme morphine with a suitable portion of refuse from a restaurant—meat, fat and some bulk of vegetable matter. Ten mixtures of this kind were left to putrefy in my laboratory for fifty days, in a warm room, covered with a glass jar. Three mixtures of the same quantity of morphine with human flesh, furnished by the medical school, were also left to putrefy. Morphine was used, and not the sulphate or the hydrochlorate, because there was plenty of the alkaloid on hand in the laboratory from previous opium assays, and it answered just as well. To one portion of human flesh (lungs, heart, stomach, liver) I added three grains of morphine sulphate from a drug store.

It was desirable, Prof. Charles A. Doremus states, in his "Chemical History of a Case of Combined Antimonial and Arsenical Poisoning" (*Journal of the American Chemical Society*, September, 1895, pages 672, 673), to ascertain if the ptomaines present might either give or mask the morphine reactions. Morphine had been prescribed. The morphine reactions were not obtainable; some of the ptomaine reactions were pronounced. Minute quantities of morphine solutions added to portions of the residues could be detected by appropriate tests.

VI. At the end of the fifty days' exposure morphine was searched for in all the mixtures by my scholars and myself by the methods of Dragendorff, of Stas-Otto and of Graham (the dialysation process), due precautions being taken against confusion in the chemical reactions. Ptomaines (or ptomatines, as it is proposed we should write more grammatically) being removed by washing the aqueous acid and the aqueous alkaline fluid respectively with ethyl ether, at summer room temperature, and with a mixture of 4 volumes of ethyl ether and 1 volume of chloroform,

as long as those solvents removed substances, giving alkaloidal reactions, precipitates, with a solution of iodine in potassium iodide and with mercurio-potassium iodide solution,

the latter solution always added to an acidulated aqueous portion.

Isobutylic alcohol is substituted for amylic alcohol in the different processes, only to avoid the bad effect of the latter on the operator (headache); otherwise it has no advantage.

VII. One case is conducted according to Kippenberger's method.

To one-third part of the human flesh, to which 3 grains of morphine sulphate, obtained in a drug store, was added, and which was kept in a dark closet, covered with a glass jar, and this again covered with earth, to putrefy—q. s. glycerin of 1·25 sp.

gr., containing 10 per cent. tannin, was added, and the whole digested two days, at 40° C., frequently stirring. The mass was strained; the residue washed with a fresh quantity of glycerin, containing 10 per cent. tannin; again strained; this operation was repeated for a third time. The combined glycerin extracts were heated to 50° C., cooled, and diluted with an equal volume of water. In an experimental way I found that this dilution was a necessity or petroleum ether would not separate clearly. Washed with petroleum ether (boiling point, 50°). Repeated this twice. Removed petroleum ether. Warmed glycerin extract, to expel traces of petroleum ether. Cooled. Washed (the extract being acid) with chloroform, removed chloroform. Now added chloroform, containing 10 per cent. alcohol. Made alkaline with NaOH. Added $NaHCO_3$. Agitated. Collected the chloroform. Evaporated it. It left a color and odorless residue, proving the excellence or superiority of this method as compared with the older ones. (Kippenberger, Beiträge zur Reinisolirung, quant. Trennung u. chem. Characteristik v. Alkaloïden u. glycosidartigen Körpern, in forensen Fällen. Wiesbaden. C. W. Kreidel. 1895.)

VIII. Good results of the methods of Dragendorff, Stas-Otto, Graham and Kippenberger, above referred to.

Applied the sulphomolybdate test (Fröhde's); obtained a most positive, decided and strong morphine reaction. The purple color appeared immediately.

Applied the ferric chloride test. One drop of the ferric chloride solution added to a residue of evaporation of a portion of the isobutylic alcohol caused the characteristic blue color reaction.

Applied the H_2SO_4 and HNO_3 test (Husemann's). A very distinct blood-red color appeared, where the glass rod, previously moistened with HNO_3, touched the H_2SO_4.

Applied the KIO_3 test. The previously colorless mixture of KIO_3, acetic acid and water became immediately brownish-yellow, upon the addition to the mixture of the solution in acetic acid of a residue of evaporation of another portion of isobutylic alcohol.

After all these satisfactory tests, half of the isobutylic alcohol, that was left, *being colorless*, was evaporated. Left a bad-smelling, amorphous residue. *A.* (Proof for the accuracy of Tamba's and Graebener's statements.) This residue was heated for an hour to 100° C.; taken up with a small quantity of acidulated water,

whereby most of it was left undissolved. It had the appearance of coagulated albumen. *B*. Decanted. Added q. s. ethyl ether, ammonia to slight excess, and left it to itself for five days, to see if morphine would crystallize out.

This experiment failed. No crystals were obtained.

IX. The fluid used to experiment upon, if morphine could be obtained in the crystalline state, was evaporated to dryness. The presence of morphine in the residue was again verified by Fröhde's and Husemann's tests. Herein lays another evidence for the separation of ptomaine-like bodies and morphine, as well as for Kippenberger's opinion, that much of what is described in our literature as "cadaver alkaloid," and as answering to general group reactions on alkaloids, is a mixture of peptones and albuminates. (See VIII, *A* and *B*.)

Conclusion.—No better conclusion can be drawn than a statement that a popular belief in the destructive power for alkaloids, of the decomposition of cadavers, has no foundation in the facts.

N. W. UNIVERSITY,
SCHOOL OF PHARMACY, May, 1896.

THE MAKING OF AN HERBARIUM.[1]

BY CLEMENT B. LOWE.

A series of practical suggestions are wanted as to the best method of collecting, identifying and preserving plants for making an herbarium.

In answering the above query, I would state that it is a pity that more pharmacists are not interested in field botany, as, aside from the valuable information thus to be obtained, the collection of plants is a healthful occupation, and tends to give the outdoor exercise which so many of them need.

In collecting plants a suitable receptacle for containing them is necessary, which should be as nearly air-tight as possible, so that the contents can be kept fresh for several days. A japanned tin box, about 17 inches long by 7 inches wide and 4 inches deep, with a lid opening nearly the length of the flat side, suspended from the shoulder by a strap, will answer the purpose well.

Many prefer to take a stout portfolio, either hinged on one side or

[1] Read before the Pennsylvania Pharmaceutical Association, at Mt. Holly Springs, June 17, 1896.

fastened on both sides by straps, containing numerous sheets of absorbent paper, and transfer the plants directly to it, as by so doing any injury to the plants is avoided and the whole can be transferred directly to the press on reaching home.

A knife or trowel for digging is of great use; the best is probably a trowel, in which the V-shaped grooved blade is driven directly into the handle. Professor Maisch used to carry a convenient cane, with a nickel-plated handle, shaped like a narrow grubbing hoe.

In collecting plants, care should be taken to collect those which are typical of the species, and yet variations from the typical form are also instructive and can be mounted by their side.

We always desire to obtain the inflorescence, and frequently also the fruit, as in some cases the latter is quite as, or more, important than the flowers, as in the case of the Umbelliferæ, where the distinction between the genera is based largely upon the fruit.

In the case of many plants, the radical (root) leaves should be gathered, as they are more characteristic than those growing upon the stem; *e. g.*, Shepherd's Purse has the root leaves clustered, and pinnatifid or toothed, while the stem leaves are arrow-shaped and sessile.

The root or rhizome should generally be gathered, as in a number of cases it is the official part of the plant, and it frequently has prominent characteristics; in the case of rare plants it is best not to do so, as some herbaceous perennials, like Senega, have in this way been almost exterminated.

There is often quite a choice as to where your botanical excursion shall be made, different regions showing different floras. Those living in the neighborhood of Philadelphia will find quite a difference between the floras of Pennsylvania and New Jersey, and no herbarium of this region would be complete without representatives from both localities.

After the plants are collected, the next step is their examination and the identification of unknown species. To do this successfully, one should have a sharp penknife, pair of dissecting needles, pair of pincettes and a dissecting microscope, the best of the latter being one which has immovable hand-rests, like Barnes', although Sayre's dissecting microscope, while not so convenient in the laboratory, can be used in the field as well.

In the examination of an unknown plant, the height, shape and epidermis of the stem should be considered, and whether endogenous or exogenous, although in most cases the venation of the leaves will show the latter just as well. The leaves should be examined as to phyllotaxy, venation, shape and size. The flowers should be examined as to the parts present, their size, shape, color, union, insertion, etc., and then vertical and transverse sections should be made, notes being made of the different observations.

When this has been done, the name can in most cases be speedily determined by means of the analytical key in the front of "Gray's Manual of Botany."

Beginners will find it easier to analyze regular flowers of fair size, such as the Corn Cockle (Lychnis Githago), which is frequently found in wheat fields, to the annoyance of the farmers; or what is still better is for the first times to take known flowers, like the apple blossom or wild rose, find the description in the "Manual," and compare it carefully. After this has been done a number of times they will be better able to proceed with unknown flowers.

Those with but little knowledge of botany will find Mrs. Dana's "How to Know the Wild Flowers," in which they are classified according to color, and many of them illustrated, an interesting book, while if they desire to increase their knowledge, they will find Professor Bastin's "Laboratory Exercises in Botany" a most valuable work. Gray's "School and Field Botany" (Revised Edition) is also an excellent work, not so technical as the "Manual," and it includes many of the cultivated as well as wild flowers.

The next step is the preservation of the specimens. They should be dried between sheets of absorbent paper, with heavier sheets occasionally interspersed, sufficient pressure being made by means of weighted boards.

Perhaps a better arrangement for drying is to use for top and bottom an open frame or lattice work, each frame consisting of two layers of half-inch strips crossing each other at right angles, having a hook in the end of each strip. The sheets of drying paper are laid between the frames, and the proper pressure is made by means of a stout cord passing around the hooks, the whole being hung where there is a current of air.

In the case of hollow leaves like the Sarracenia (Pitcher plants), or flowers like Cypripedium acaule (Stemless Lady's Slipper), ab-

sorbent cotton should be placed in them to facilitate drying, and to preserve their outlines.

Specimens should be dried as rapidly as possible, to preserve their color and general appearance, and the driers should be changed every day for five days; still better results will be obtained by changing them two or three times during the first twenty-four hours.

According to Schroeder (AMER. JOUR. PHARM., 1896, p. 132), heavy gray felt paper, saturated with a 3 per cent. solution of oxalic acid and allowed to dry, will preserve unchanged the color of the petals, and in most cases the green of the leaves.

When the plants are thoroughly dried they should be poisoned by applying a nearly saturated solution of corrosive sublimate with a soft brush, the plants being laid upon a flat dish, and afterwards placed between driers until the alcohol evaporates.

Then follows the mounting of the specimens. Sheets of white paper, 11½ x 17½ inches, about 30 pounds to the ream of 480 sheets, are best for this purpose. They should be fastened to the sheets either by narrow strips of isinglass plaster, or better, directly by means of a liquid glue like Le Page's.

To the right-hand lower corner of each sheet should be affixed a label, something like the following, which, for the purpose of illustration, is written out as it would be if affixed to the plant Chelidonium:

Herbarium, C. B. Lowe. Bot. Name, Chelidonium majus. Synonym, Celandine. N. O., Papaveraceæ. Locality, Tulpehocken, 4/22/'96.

Each specimen or all of the same species may be enclosed in a sheet of white paper of less weight than that upon which they are mounted.

All of the species of the same genus should be then enclosed in a genus cover of heavy manilla paper.

The name of the genus, with that of the natural order, should be written in a large hand upon the lower left-hand corner of the cover next the back. The name of the enclosed species can be written upon the lower right-hand corner. The genera can also be numbered according to "Gray's Manual."

The herbarium should be preserved in a suitable receptacle, free from dust. This may consist of a cabinet, with shelves of the proper width and depth for the genus covers to slide in easily, or of a number of plain boxes with shelves 4 or 6 inches apart and doors which shut flush. The names of the orders can be pasted upon the shelves or affixed to the edge of the genus board, which contains a list of the genera of the order, and is inserted at its beginning.

A CONTRIBUTION TO THE KNOWLEDGE OF SOME NORTH AMERICAN CONIFERÆ.

BY EDSON S. BASTIN AND HENRY TRIMBLE.

(*Continued from page 337.*)

THE GENERAL CHARACTERS OF THE SPRUCES.

The important genus Picea numbers about a dozen species, all inhabiting the mountainous regions of the North. Two of them are native to the Northeastern United States, three to our Northwest, two are European and five are Asiatic. They are straight-boled, evergreen trees, of pyramidal form and rather slow growth; whitish, soft, close-grained and somewhat resinous wood; alternate, acicular, tetragonal leaves, which are very numerous and compactly arranged on the younger branches, and seldom exceed an inch in length.

The leaves are sessile and the persistent bases prominent, giving a rough appearance to the branches. The tetragonal form of the leaf is due to the fact that both the upper and the lower surfaces are keeled. Stomata usually occur in rows on all four faces; but, frequently, the rows are less numerous on the two faces of the lower surface. Internally, the leaves show a central stele, containing a small, usually distinctly double, collateral fibro-vascular bundle, surrounded by a more or less copious transfusion tissue, similar to that of the pines. The stele is separated from the mesophyll by a distinct endodermis. The mesophyll is composed of parenchyma, which has wavy, but not folded, walls. The epidermis is supported by a hypoderma, usually one-, but sometimes more than one-layered. Elongated oil tubes occur at the lateral angles of the leaves, but are frequently not continuous from end to end, so that a cross-section often shows but one or none. The staminate flowers are axillary, or sometimes terminal, on the branchlets of the preceding year,

cylindrical or oblong, short-stalked and scaly at the base; the connective of the anthers is prolonged to form a rounded, erect crest; the two pollen sacs dehisce longitudinally. The pistillate flowers

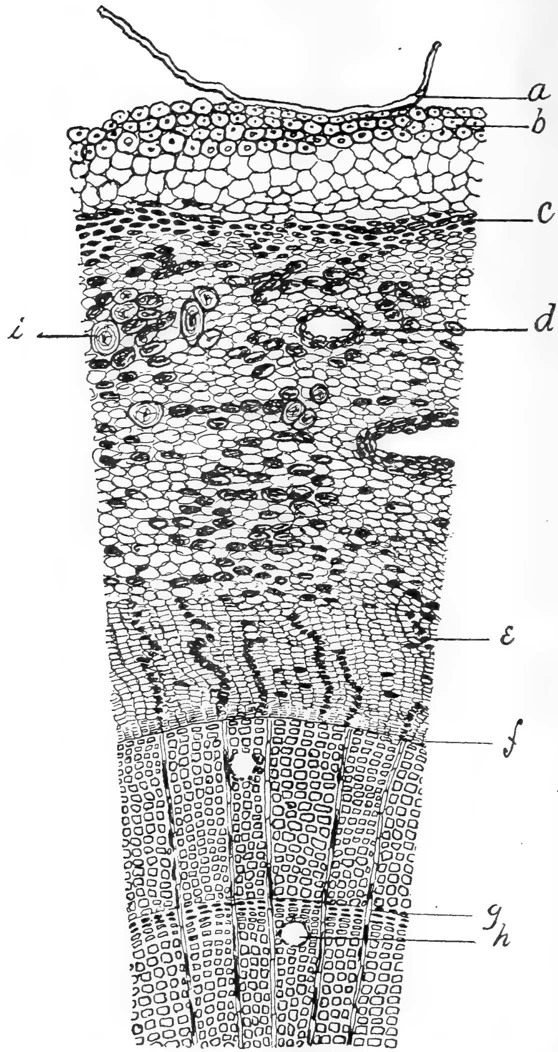


Fig. 38, from cross-section of stem of Picea alba, magnified 75 diameters. *A*, cuticle; *b*, hypoderma; *c*, periderm; *d*, secretion reservoir; *e*, tannin cells in bast; *f*, cambium; *g*, ring of growth; *h*, secretion reservoir in wood; *i*, stone-cell.

are terminal, the fertile scales much exceeding the bracts; the cones are pendulous, maturing the first year; the seeds are winged, and the embryo has from four to eight cotyledons.

PICEA ALBA, LINK.

WHITE OR SINGLE SPRUCE.

This species occupies the northern portion of our continent from Newfoundland, through Labrador, the Hudson's Bay region, mouth of the Mackenzie River, and the Valley of the Yukon. It occurs also in northern Maine, northern New Hampshire, northern Vermont, northern New York, Canada, northern Michigan, northern

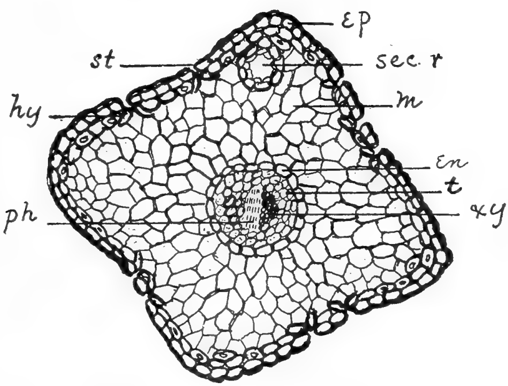


Fig. 39, cross-section of leaf of Picea alba, magnified 75 diameters. *Ep*, epidermis; *hy*, hypoderma; *st*, stoma; *sec. r*, secretion reservoir for oleoresin; *m*, mesophyll cell; *en*, endodermis; *t*, transfusion tissue; *xy*, xylem of bundle; *ph*, phloem.

Wisconsin, north shore of Lake Superior, northern Minnesota, the Black Hills of Dakota, Montana and British Columbia. The tree, under favorable conditions, attains a height of 150 feet or more, and a diameter at its base of 2 or 3 feet, but in the eastern portion of the United States it is usually smaller, seldom reaching a height of 100 feet. It favors damp soil, the borders of streams and lakes, and swampy regions. Its general aspect is lighter than that of any other species of its genus, its leaves being glaucous, its twigs smooth and light-colored, and its bark lighter than that of the other species. Its cones are oblong-cylindrical, pendulous and lax, and its scales thin and entire-margined. The length of the cones varies

from $1\frac{3}{4}$ to $2\frac{1}{2}$ inches, and the thickness from $\frac{5}{8}$ inch to $\frac{3}{4}$ inch. The color of the cones is light brown.

MICROSCOPICAL STRUCTURE.

A cross-section of a twig of two years' growth showed the following structure: The thick-walled epidermal cells were supported by two or three layers of thick-walled fibres. Beneath this was a large-celled, thin-walled parenchyma, consisting of several layers of cells. This was succeeded internally by bands of periderm, composed in part of stone cells, and in part of thin-walled cells containing much tannin. Interior to these was a copious parenchyma, containing numerous scattered tannin cells and some secretion reservoirs for oleoresin. The bast layer contained no lignified fibres, and there were numerous large secretion cells containing tannin; these were arranged in tangential rows. The medullary rays of this layer were wavy, and its cells were also rich in tannin. The xylem closely resembled that of the pines, except that the secretion reservoirs were rather less numerous and smaller. A longitudinal-tangential section showed medullary rays, longer and more numerous than those of the pines. In the bark were observed scattered clusters of stone cells, and some cells containing crystals of calcium oxalate.

The leaves of Picea alba are of small size, from $\frac{1}{2}$ to $\frac{3}{4}$ inch long and about $\frac{1}{50}$ inch thick. They are quadrangular-prismatic, sharp-pointed, and have on each of the four sides two or three more or less interrupted rows of stomata. The secretion reservoirs at the lateral angles are of small size. The epidermis has the outer walls of its cells thick and strongly cutinized; the lateral and inner ones much less thickened. The hypoderma is composed of one layer of cells, some of them with thin walls, others with thick ones. The mesophyll is composed of wavy-walled cells. The fibro-vascular bundle is thin and has, at the upper margin of the phloem, a few thick-walled fibres. The transfusion tissue is few-layered, and the endodermis distinct and composed of cells having their radial walls somewhat thickened.

(*To be continued.*)

Dr. A. L. Metz, who was appointed temporary Professor of Chemistry to fill the vacancy in the Medical Department of Tulane University, New Orleans, caused by the death of Professor Joseph Jones, has been elected permanently to the chair.—*Medical News.*

IT IS ASSERTED THAT MANY OF THE SO-CALLED MALT EXTRACTS SOLD ARE LITTLE OR NOTHING MORE THAN A STRONG BEER. TO WHAT EXTENT IS THIS TRUE?[1]

By Louis Emanuel.

An answer to the above query leads one to ask: (1) What is beer? (2) What are the properties of beer? (3) What are the properties of liquid malt extract?

Beer should be a fermented infusion of hops and barley malt. Good lager beer should have a specific gravity of 1·0159, contain 3·5 per cent. of alcohol and 5·5 per cent. of extractive. According to a German authority, the extractive consists of the soluble part of malt and hops, partly unchanged and partly converted into decomposition products; among the former are maltose, gum, dextrin, peptone, hop resin and alkaloidal substances; among the latter, glycerin and fatty acids. It will be observed that diastase is not mentioned.

One of the most important properties which a malt extract should have is the power of converting starch into sugar. F. Elsner, in his "Hülfsbuch für Chemiker, Apotheker und Gesundheitbeamte," says: "A good malt extract should be able to convert its own weight of starch into sugar, at a temperature of 55° C., in not more than fifteen minutes."

Six of the most popular malt extracts were examined, a sample of beer, also an infusion of malt. The following table will show comparisons:

Liquid Malt Extract.	Specific Gravity.	Alcohol.	Extractive.	Diastatic Power.	Quantity.	Cost.
		Per Cent.	Per Cent.		c.c.	
No. 1	1·046	2·5	13·	None.	300	$0.25
No. 2	1·042	3·5	11·	—	320	.25
No. 3	1·030	6·	10·5	—	320	.11
No. 4	1·038	1·75	8·	—	360	.17
No. 5	1·045	3·5	13·5	—	340	.17
No. 6	1·064	1·75	19·	—	360	.19
Infusion	—	—	10·	30 minutes.	—	—
Beer	1·016	3·5	5·	None.	500	.05

[1] Read before the meeting of the Pennsylvania Pharmaceutical Association, June 18, 1896, in answer to query 79.

The diastatic power was tested in the following manner: A 1 per cent. potato starch mucilage, made by rubbing 10 grammes of potato starch with 50 c.c. of water, pouring the mixture into 900 c.c. of boiling water, the boiling continued for half an hour, cooled to 55° C., and enough water added to make 1,000 c c. Of this mucilage, 5 c.c. were mixed with 90 c.c. of water at 55° C., and 5 c.c. of liquid malt extract added. This mixture was then put into a bottle and a temperature of 55° C. maintained by means of a water bath for five hours. Tests were made at first every five minutes, and later at longer intervals.

In order to confirm, or rather to ascertain, whether or not the above method was a fair indication of the absence of diastase the liquid extracts were evaporated at a low temperature (not exceeding 60° C.) to a thick extract, and treated in the manner recommended by Dunstan and Dimmock, but no better results were obtained. The presence of alcohol and the absence of diastase indicate into what class of preparations liquid malt extracts may be placed.

In this connection, the following, taken from U. S. Internal Revenue regulations, 1893, may be of interest:

A druggist is not required to pay tax as a rectifier for recovering alcohol previously used by himself in the preparation of his medicines. Nor shall any special tax be imposed upon apothecaries as to wines or spirituous liquors which they use exclusively with preparation or making up of medicines.

By the provision of Section 3,246, Revised Statutes, a druggist is permitted to keep spirits and wines, and to use them in combination with drugs in the preparation of medicines that are not beverages, and to sell such medicines without paying special tax as a liquor dealer under the internal revenue laws of the United States. But under the uniform rulings of this office, and the decisions of the United States Courts, he cannot, without subjecting himself to the special tax, sell spirits or wines that are not combined with drugs or materials of any kind, taking the liquors out of the class of beverages, even when he sells the liquors on a physician's prescription, and for medicinal use only.

Besides the medicinal compounds which a druggist is authorized to sell without paying special tax as a liquor dealer, although they contain alcoholic liquors there are other compounds containing spirits, which, while they are not medicinal, are non-potable articles that do not come under the head of distilled "spirits, wines or malt liquors" in contemplation of the internal revenue laws, and which, therefore, he is entitled to sell without paying special tax; *e. g.* toilet articles, such as cologne, bay rum, "ether with alcohol" for use in photography; benzine or ether with alcohol for cleaning purposes; castor oil and alcohol for toilet use, Florida water, violet water, etc., toilet articles made from alcohol, camphor and alcohol, alcohol, ammonia and whiting, a cleaning preparation, alcohol and shellac for painters, etc. Wyeth's malt extract, which

is held out as a medicine, has been represented under oath, by the druggists who manufacture it, as containing the chemical principles of diastase, dextrin and maltose in such strength as would produce nausea if it should be used as a beverage; this, and other like extracts of malt held out as medicines and not as beverages, are not regarded as medicines until facts brought before this office show that they belong in the class of malt beverages (liquor) referred to in Section 3,339, Revised Statutes. Meanwhile, druggists who sell them in good faith, as medicines only, are not to be called upon to pay special taxes as dealers in malt liquors on account of such sales.

THE DETECTION OF ACETANILID IN SOME CLOSELY RELATED SYNTHETICAL REMEDIES.[1]

By Frank X. Moerk.

The synthetical remedies embraced in this investigation are either immediate derivatives of anilin, $C_6H_5NH_2$, as

Acetanilid	$C_6H_5NH(COCH_3)$
Exalgin (methyl-acetanilid)	$C_6H_5N(CH_3)(COCH_3)$

or of para-oxyanilin, better known as para-amido-phenol. Of this the methyl-ether is called anisidin, the ethyl-ether phenetidin (their relation to each other and to their medicinally important derivatives is best seen from their formulas):

Para-amido-phenol	$C_6H_4(OH)NH_2$
Anisidin	$C_6H_4(OCH_3)NH_2$
Phenetidin	$C_6H_4(OC_2H_5)NH_2$
Methacetin (acet-para-anisidin)	$C_6H_4(OCH_3)NH(COCH_3)$
Phenacetin (acet-para-phenetidin)	$C_6H_4(OC_2H_5)NH(COCH_3)$
Phenocoll (glycocoll-para-phenetidin)	$C_6H_4(OC_2H_5)NH(COCH_2NH_2)$
Lactophenin (lactyl-para-phenetidin)	$C_6H_4(OC_2H_5)NH(COCHOHCH_3)$
Salophen (acet-para-amido-phenol salicylate)	$C_6H_4(C_7H_5O_3)NH(COCH_3)$

Of these remedies, phenocoll is the only one used in the form of the "hydrochlorate," the free base not being medicinally important; the word "phenocoll," in the following parts of this paper, refers to the important "phenocoll hydrochlorate."

Of the various tests that have been published for the detection and identification of acetanilid, none has had the scope given to it which is intended in this paper. Of these tests only one is based

---

[1] Read at the meeting of the Pennsylvania Pharmaceutical Association, June 18, 1896.

upon the formation of a precipitate; one depends upon the generation of an odorous compound, the rest upon color reactions. Preference was given to the first of these, because when published by E. Hirschsohn, in the *Pharm. Ztschr. f. Russland*, it was offered as a means of detecting 5 per cent. acetanilid in phenacetin; therefore it had the same object in view as the present paper. This publication of Hirschsohn was abstracted in the AM. JOUR. PHARM., 1889, 77, as follows: "Antifebrin in phenacetin, if present to the extent of 5 per cent. or more, can be readily identified by making a saturated aqueous solution, and adding to this half a volume of bromine water. Antifebrin decolorizes the bromine water immediately, and in a few moments a crystalline precipitate appears. Phenacetin neither decolorizes the bromine water, nor gives the precipitate, which is supposed to be acet-para-bromanilide, and is almost insoluble in water." In Dr. B. Fischer's "Die Neuren Arzneismittel," sixth edition, p. 177, the test is stated as follows: "If 0·1 gm. phenacetin be dissolved in 10 c.c. hot water and filtered after cooling to the temperature of the room, the filtrate, upon addition of sufficient bromine water to impart a yellow color, should not become turbid. This test will indicate an adulteration with acetanilid, the latter being much more soluble in water than phenacetin, and therefore is to be found especially in the filtrate, giving, with bromine, a precipitate of para-bromacetanilid; allowed to stand for ten minutes, 5 per cent. of acetanilid can be detected with certainty." This test, according to B. Fischer, is also satisfactory in distinguishing between acetanilid and methacetin, the latter, in saturated aqueous solution, not giving a precipitate with bromine water. Flückiger, in his "Reactionen," states that phenocoll hydrochlorate in aqueous solution gives a temporary turbidity with bromine water, which becomes more permanent with a large excess of bromine water. These are all the references found relating to this test.

For the following experiments 1 per cent. solutions of *exalgin* and *phenocoll*, and saturated solutions of the less soluble *acetanilid*, *phenacetin*, *methacetin*, *lactophenin* and *salophen* were used, with these preliminary tests, proved that a decided excess of bromine water produced precipitates with acetanilid, lactophenin, exalgin and phenocoll, and a decided turbidity with methacetin; in the last three cases a distinct turbidity could be noticed as the bromine water was allowed to drop into the solutions, disappearing upon agitation, until

an excess of bromine water had been added, when the turbidity or precipitate became permanent. Exalgin in this test separated yellow oily drops. The tests were then modified, bromine water being added, drop by drop, during a period of five minutes, as fast as the color was discharged.

	c.c. Bromine Water Added.	Appearance after Stirring Five Minutes.
Acetanilid	2·0	Yellow liquid; white ppt.
Exalgin	0·8	Colorless liquid; white ppt.
Methacetin	1·8	Yellow liquid, becoming colorless, pink, finally red-brown, slightly turbid.
Phenacetin	0·6	
Phenocoll	2·0	
Lactophenin	1·2	Liquid like above; distinct white ppt.
Salophen	0·1	Colorless, slightly turbid liquid.

By agitating the tests afterwards with a light petroleum-benzin it was found that the exalgin precipitate was readily soluble (yielding beautiful white crystals upon the evaporation of the benzin), the acetanilid precipitate slightly soluble (yielding a small quantity of crystals upon the evaporation of the benzin), while the lactophenin precipitate was insoluble; ether does not give such satisfactory results, as it takes up *all* of the precipitates besides coloring substances produced in the other tests. The bromine test, therefore, gave hopes of being applicable to the detection of acetanilid in all of the remedies excepting lactophenin; it, hence, was of importance to determine its sensitiveness with acetanilid solutions. With 1 : 2,000 solutions in distilled water the precipitate with bromine water could always be obtained after stirring for several minutes; solutions of greater dilution, 1 : 10,000, were not certain to yield the precipitate, even after prolonged standing or stirring. The test, therefore, should be practical in solutions containing not less than 1 : 2,000; this calculated to 0·1 gm. of any of the remedies with 10 c.c. water, would be equivalent to indicating 5 per cent. acetanilid—the claim made by Hirschsohn. To substantiate this and test its greater applicability, 0·1 gm. of each of the remedies were heated with 10 c.c. of a 1 : 2,000 acetanilid solution, the solution cooled, filtered and 5 c.c. of the filtrate used as before; the results, excepting with salophen and exalgin, were disappointing, as it was not possible to certainly distinguish between the tests made with distilled water or with the acetanilid solutions. After trying the effect of varying quantities of bromine water, added slowly or in one portion to so-

lutions which had been rendered neutral, acid or alkaline without better success, the test was finally given up as far as detecting 5 per cent. acetanilid in phenacetin, methacetin, phenocoll and lactophenin, was concerned.

The *iso nitrile test*, depending upon the formation of phenyl isocyanide or phenyl carbylamine, C_6H_5NC, by heating acetanilid with solution of soda or potassa and a few drops of chloroform or a little chloral hydrate, and recognition of this by its peculiar and offensive odor, was next tried. This iso-nitrile test, it must be remembered, is a class reaction, all primary amines heated with alkali and chloroform giving rise to unpleasant odors due to the formation of isocyanides; its application for the purpose in view, therefore, resolved itself mainly into a question of determining whether the remedies other than acetanilid gave rise to phenyl isocyanide or to some other body interfering with the recognition of this. Dr. Fischer states that the odor is furnished by acetanilid and phenacetin, but not by methacetin or exalgin when heated for a short time. Flückiger states that acetanilid and methacetin yield it; phenacetin gives rise to it, or at least a similar odor; exalgin gives a different, not unpleasant, odor. It will be noticed that these statements are to a certain extent at variance with each other.

Tests were made by using 2–3 c.c. of the solutions of the remedies as made for the bromine test, an equal volume of 5 per cent. solution of potassa was added, the solution heated to the boiling point, a few drops of chloroform added, boiled again, and the odor noted after the excess of chloroform had evaporated. Salophen was the only one to yield an odorless product; the other tests gave rise to odors differing, however, from that of phenol isocyanide as obtained from acetanilid. The delicacy of this reaction leaves nothing to be desired, as it was obtainable with an acetanilid solution, 1 : 200,000, and some individuals will find even a greater dilution satisfactory.

Knowing that the value of the test would be increased if it were possible to remove the odors due to the other remedies, the use of potassium permanganate suggested itself, and was successfully used with all remedies excepting exalgin, where it undoubtedly caused the formation of phenyl isocyanide instead of improving the test. Acetanilid requires the use of but little permanganate in a blank test, and this did not interfere with the delicacy of the test; when, however, considerable permanganate had to be added, it was found

that 1 per cent. acetanilid in phenacetin might not yield the odor; the addition of a very small quantity of ammonia in such cases was found to at once give rise to the odor and to be unobjectionable in other respects. To more quickly reduce the permanganate, a mixture of alcohol and chloroform was found suitable.

A series of experiments, in which 0·1 gramme each of the remedies was dissolved in 10 c.c. of an acetanilid solution, 1 : 10,000, and the filtrate treated as will be described, demonstrated that 1 per cent. acetanilid in these remedies could easily be detected, and, if necessary, much smaller quantities. Pure exalgin, as stated before, gave rise to an odor, but this did not interfere with the recognition of phenyl isocyanide; pure phenocoll likewise gives a faint odor, which does not interfere; the others, when pure, yield tests destitute of odor.

The test for an adulteration with acetanilid is to be made as follows:

0·1 gm. of *methacetin*, *phenacetin*, *lactophenin*, *salophen* or *phenocoll hydrochlorate* are boiled with 10 c.c. water (salophen is the only one not soluble in 10 c.c. boiling water); then cool quickly by immersion in cold water and filter through cotton. To 2–3 c.c. of the filtrate add an equal volume of 5 per cent. solution of potassa (or soda), boil and add small fragments of potassium permanganate until the green color first produced gives way to a violet or purple after boiling; then add two or three drops of a mixture made of chloroform 10 c.c., alcohol 10 c.c., and water of ammonia 0·5 c.c.; boil and again add some of this mixture if the permanganate has not been reduced completely to brown manganic hydrate; after the chloroform has vaporized by standing a few moments, note the odor and compare it, if doubtful, with that yielded by a dilute acetanilid solution.

In testing exalgin omit the potassium permanganate, otherwise the test is made as above.

This method of applying the iso-nitrile test accomplished the object of the investigation, and will, no doubt, be found of even more extended application.

Mr. Michael Carteighe, who for fourteen years has been President of the Pharmaceutical Society of Great Britain, was succeeded at the last election, June 3d, by Mr. Walter Hills. Resolutions recognizing the Society's appreciation of Mr. Carteighe's services were passed by the Council.

COLOR TESTS OBSERVED WITH SOME SYNTHETIC REMEDIES.[1]

By Frank X. Moerk.

(1) Saturated solutions of *phenacetin, methacetin, lactophenin* and a 1 per cent. solution of *phenocoll hydrochlorate*, mixed with sufficient bromine water to give a pale yellow color, will, in a short time, become colorless, then pink-red, and finally brown; the addition of alkalies or alkaline carbonates will cause the pink or red color to become much deeper; lactophenin also deposits a white precipitate, while the other solutions remain clear for a considerable time, unless they are stirred, when a turbidity may be noticed.

(2) If solutions of the substances mentioned in the preceding test be thoroughly agitated with an equal volume of bromine water and then with half a volume of petroleum-benzin, the phenocoll hydrochlorate test will speedily develop in the aqueous solution a pale red or violet color, changing to a color probably best described as "crushed raspberry or strawberry;" the other aqueous solutions will become yellow and brown. Some of the benzin solutions, removed to small beakers and evaporated, will leave yellowish or brownish residues, the quantities being in the order—phenocoll, methacetin, phenacetin and lactophenin; if a little water be added to these residues and heat applied, phenocoll yields a yellow solution, methacetin and phenacetin purplish solutions, the first-mentioned being decidedly deeper in color, while lactophenin gives a hardly perceptible pinkish solution.

(3) 0·010 gm. *salophen* boiled for a minute or two with 5 c.c. solution of potassa (5 per cent.), and then agitated so as to mix the solution with atmospheric oxygen, will develop a green color; upon standing, the color may change to yellow, red or violet, but agitation will restore the green color again or develop a blue color. *This test is not given by any other remedy mentioned in this paper*, the solutions obtained being colorless.

(4) If to 0·010 of the following remedies, boiled for a minute or two with a 5 c.c. solution of potassa, a *very minute* fragment of potassium permanganate be added, and again boiled, *salophen* will yield a blue or greenish coloration; *phenacetin, methacetin, phe-*

[1] Read at the meeting of the Pennsylvania Pharmaceutical Association, June 18, 1896.

nocoll, lactophenin, acetanilid and *exalgin*, yellow and but slightly turbid solutions; after cooling by immersing in cold water, and supersaturating the tests with acetic acid, *salophen* becomes yellowish red; *phenacetin, methacetin, lactophenin* and *phenocoll* become purplish red (permanganate color); *acetanilid* yellow and then yellowish red; *exalgin* bluish green. This last test, upon addition of ammonia, then gives rise to a lilac coloration.

If too much potassium permanganate be added in this test, some of the colors will not be obtainable; there should be a turbidity, but not a distinct precipitate of manganic hydrate, after boiling with the added permanganate.

SUMBUL.[1]

By John H. Hahn.

The late Professor Maisch stated, in the *National Dispensatory*, after giving a brief description of the constituents isolated by Reinsch in 1848, and Murawjeff in 1853, that the chemistry of sumbul required further researches. It was this statement that prompted the writer to investigate the subject.[2] The root analyzed was obtained in open market, and reduced to powder by grinding.

1,000 grammes were thoroughly wetted with petroleum benzin and allowed to stand for two days; the whole was then transferred to a glass percolator and the drug exhausted. The percolate was evaporated until no weight was lost, and the residue devoid of the odor of petroleum benzin. By this means 17·25 per cent. of fixed oil was obtained, of a yellowish or yellow color, becoming black-brown by age. It was thick, viscid, rather bland, but afterwards of a bitterish taste, and when rubbed between the fingers gave a disagreeable odor. It was soluble in alcohol, ether and bisulphide of carbon, and was readily saponified by a solution of potassa. Upon

---

[1] Read at the meeting of the Pennsylvania Pharmaceutical Association, June 18, 1896.

[2] *Query No. 82.*—It is asserted that a larger part of the sumbul root of commerce is fictitious; if it is so, what does it consist of, and how does it differ from the genuine?

In reference to this query, no evidence could be gathered which would warrant the statement made in the above query. In proof of this, four analyses were made, from as many samples obtained from as many different firms, and all gave the same results both chemically and physically.

adding a drop of sulphuric acid to three or four drops of oil, a crimson-brown color was produced, changing in a short time to a beautiful dark purple, and after twenty-four hours becoming brownish-black.

By mixing the above fixed oil with a quantity of petroleum benzin, and pouring the whole upon a filter, crystals were deposited, which were thoroughly washed with petroleum benzin, redissolved in bisulphide of carbon and allowed to recrystallize; further than this they were not investigated.

The drug contained 4 per cent. of moisture and 8 per cent. of a grayish-white ash.

NOTES ON THE RECENT LITERATURE OF BOTANY AND MATERIA MEDICA.

By George M. Beringer.

Dilem and Patchouli.

The source of the commercial product known as oil of dilem,[1] received from Java, and closely resembling oil of patchouli in odor, is the subject of two communications in the *Pharmaceutical Journal*, March 21, 1896, p. 222, from J. Ch. Sawer and E. M. Holmes.

The word *dilem* appears to be applied to the leaves of a number of species of Pogostemon, used for stuffing mattresses, etc.

From an examination of herbarium specimens, Mr. Holmes expresses the opinion that the dilem plant of European commerce is the Pogostemon comosus, Miq.

From his study of this genus, Mr. Holmes concludes that the true patchouli, Pogostemon patchouli, Pell., is really indigenous to the Philippine Islands. The plant is cultivated at Penang, in Java, and in India. He also concludes that the patchouli plant of Khasia and Assam, named in "Flor. Brit. India," Plectranthus patchouli, Clarke, is quite distinct, and that the leaves cannot be confounded with the true patchouli. It has cordate-ovate, acuminate, crenate-serrate leaves, with scattered hairs and flowers, in which the upper lip is hooded almost as in Scutellaria, with inflorescence, in a loosely

---

[1] From the semi-annual reports of Schimmel & Co., we glean that dilem leaves yield 0·9 per cent. of oil having a specific gravity of 0·962. The patchouli plant yields three cuttings at half-yearly intervals. It is important, in order to obtain the yield of oil, that the leaves be dried in the shade.

panicled cyme. It is now placed in a new genus, as Microtœna cymosa, Prain.

The Palmettos of the United States. Prof. C. S. Sargent, *Garden and Forest*, Vol. IX, p. 151, in a paper on "The Tree Palms of the United States," describes the cabbage palm or cabbage palmetto, Sabal palmetto, and its technical uses. This palm inhabits the coast region of the South-eastern States, from an island off the mouth of Cape Fear River, in North Carolina, to Southern Florida, and along the Gulf coast to the Apalachicola. The large terminal leaf-bud of this tree is cooked as a vegetable. The custom is an extravagant one, as the removal of the bud kills the tree. The fibres of the young leaves are now used for making scrub-brushes. The top of a young plant with its bud is cut off, trimmed down to a disk of about 8 inches in length, and then, after the soft edible core has been removed, boiled to separate the fibres. The removal of the top kills the plant, and as one concern in Jacksonville alone consumes 7,500 buds a week, the time is not very far distant when the Sabal palmetto will become a rare tree. The trunks of this tree are found to withstand the attacks of the teredo, and are extensively used for wharf piles.

Prof. Henry Trimble, *Garden and Forest*, Vol. IX, p. 182, has examined the tannins of the palmettos and states: "That the reports which have circulated in regard to the tanning value of the palmetto have, no doubt, always referred to the scrub palm (Serenoa serrulata[1]), and excellent leather has been prepared from it. A recent sample yielded the following percentages on analysis:

	Moisture.	Ash in Absolutely Dry Material.	Tannin in Absolutely Dry Material.
Stem above ground	8·56	5·68	5·48
Root	7·46	4·43	7·58

The tannin is associated in the plant with a large proportion of red coloring matter, which has a tendency to make a dark leather.

[1] To the pharmacist the saw palmetto has acquired some interest, as the fruit has been claimed to possess nutrient value, and as a catarrhal remedy. It is lauded by the manufacturers of certain proprietaries, as possessing tonic action on the genital organs, and as reducing enlargement of the prostate gland. From a paper on the "Botany, Histology and Pharmacy of Saw Palmetto," contributed by Dr. H. H. Rusby, Mr. W. A. Bastedo and Prof. Virgil Coblentz, to the New Jersey Pharmaceutical Association, the following note is abstracted. The description of the plant is as follows: "The trunk is horizontal and sub-

The pure tannin gave reactions which indicated its close relationship with that from oak bark, and this is confirmed by the ultimate analysis.

Specimens of the cabbage palm examined yielded the following percentages:

	Moisture.	Ash in Absolutely Dry Material.	Tannin in Absolutely Dry Material.
Section near ground	10·04	7·80	1·79
Section near top	8·35	3·78	1·54

The credit has frequently been given to tannin for enabling the wood of this palm to withstand the attack of the teredo, but it is evident from these figures that this property must be attributed to something else.

A New Adulteration of Senega. C. Hartwich, *Pharmaceutical Journal*, 1896, p. 290, describes the macroscopical and anatomical characters of a new adulterant of senega met in the European market. The author decides that it is the underground portion of Triosteum perfoliatum, L., a North American plant, known under the common names of fever-root, wild coffee and horse gentian, and growing extensively

---

terranean at a depth of from 2 to 4 feet; 2 to 13 feet long, 6 to 8 inches in diameter; possessing ascending or erect branches, and fed by roots about ½ inch in diameter, and penetrating 4 to 10 feet deeper. Exceptionally, in very rich soil, the trunk will rise vertically even 6 or 8 feet high. The petioles are densely spiney-serrated, whence its name, though in dense shade these serrations are wanting. In hummocks the foliage is of a deep green, while in the open level woodlands it exhibits a yellowish shade, and on the coast-fringe it is of a distinctly bluish-green. The time of blooming varies from April to June. The fruit, when fully ripe, becomes black and glaucous. The branching spadices, of which there are several, form large, pendulous panicles in fruit, 18 to 24 inches long, weighing 6 to 8 pounds. Four panicles, yielding 40 pounds of fruit, have been collected from one plant at Ormund. The fruit is a one-seeded drupe, oblong-ovoid in form, ½ to 1 inch in length and about half as broad. The epicarp is rather thick and tough, and strongly cutinized. The sarcocarp is slightly fibrous or stringy. The putamen is crustaceous, thin, smooth and free from the contained seed." Prof. Coblentz obtained, on distillation, a small amount of volatile oil. Extracted with benzol, the fruit yielded a small quantity of essential oil, a trace of an alkaloid, an indifferent resin, a non-drying saponifiable oil and a fat. The alcoholic extract consisted largely of glucose and the acidulated water extract of vegetable albumin, dextrin and glucose.

through the Northeastern States and in the Northwestern and Western States likewise.

Media for Preserving Algæ and Fungi.

W. A. Setchell and J. V. Osterhout (*Botanical Gazette*, Vol. XXI, p. 140) have experimented with a number of aqueous solutions for the preservation of marine and fresh-water algæ for laboratory purposes. One per cent. chrome alum in either water or sea-water, according to the habitat, is recommended. The algæ, carefully selected, are washed free from dirt and placed in it at once and preserved until needed for examination. Very little washing is needed afterwards to permit of staining by any of the ordinary staining reagents. The color is not retained perfectly, but is generally better preserved than by any of the other media tried. The specimens must be kept in glass-stoppered jars; the addition of a small quantity of camphor or formalin is recommended to prevent mold formations. One per cent. chrome alum solution is also an excellent preserving fluid for use with fungi, mosses, ferns and even flowering plants, being considered by the writers superior even to alcohol for this purpose.

One to two per cent. solutions of formalin fix and preserve any ordinary vegetable tissue. While the color fades more rapidly than with chrome alum, the cell contents are preserved equally well. Formalin, in the same percentages, works excellently for fungi and the higher plants. Toadstools are preserved in their natural shapes, and in more or less of their natural colors, according to the species. Camphorated water is very useful when considerable collections have been made, and cannot be examined for several hours. Perhaps the most important use of camphor water is to preserve specimens already fixed by other fluids.

Cyanophyceæ are best prepared in solutions containing 1 per cent. each of chrome alum and formalin. Chlorophyceæ—chrome alum is preferred, but either of these media will answer. Phæophyceæ do well when placed immediately in 1 per cent. formalin in sea-water. Rhodophyceæ—the coarser forms may be put into any one of the three solutions, and be kept in a very excellent condition; chrome alum preserves more color than formalin or camphor water. For finer study, the writers recommend fixing in picric acid, washing and preserving in camphorated sea-water.

North American Cactaceæ. The revision of the North American species of Cactaceæ, by Prof. John M. Coulter, is one of the most important of the contributions from the United States National Herbarium. The first part of this work, containing the genera Cactus, Anhalonium and Lophophora, appeared in June, 1894. The second part bears the date of issue as April 1, 1896, and revises Echinocactus, Cereus and Opuntia. Fifty-two species of Echinocactus are described, with habitat and specimens examined. Eighty-two species of Cereus are similarly treated, and one hundred and one Opuntia are enumerated. Opuntia vulgaris, Mill., becomes Opuntia opuntia (L.), Coulter; and Opuntia refinesquii, Engelm, of the manual, is now Opuntia mesacantha, Rof., and its geographical distribution is fixed as only west of the Alleghenies.

The Chemists' Exhibition, conducted by the *British and Colonial Druggist*, will be held this year at the Nation Skating Palace, Argyll Street, London, August 24th to 28th, inclusive. The one held last year was visited in the four days by over 19,000 people, and that success has been the reason for the management repeating it this year on a still more extensive scale.

Some interesting facts about *maple sugar* are given in the *Garden and Forest* of May 13th, by Professor F. A. Waugh, of the University of Vermont. The State of Vermont produced, in the season just closed, some 15,000,000 pounds of maple sugar, which is greater than the output of any other State in the Union. The tapping this year commenced about March 25th, and, after an unusually short season, which closed about April 15th, an amount of sugar below the average in quantity, but considerably above the average in quality, was collected. The use of improved evaporators gives cleaner and lighter-colored sugar than could be made in the old-style kettles, and the prejudice against the lighter-colored article is rapidly disappearing. It is probable that, without reference to this year's crop, the production of maple sugar in Vermont is on the increase, which comes both from the working of a larger number of trees and from better methods of manufacture.

The prices realized for sugar and syrup vary greatly. Some of the first sugar put on the market brought the makers 16 to 17 cents a pound, while a great deal was sold in the country markets at 7 to 10 cents. Probably the bulk of the crop sold up to date brought the producers 10 to 12 cents. Syrup sold generally at from 60 to 90 cents a gallon. The Vermont farmer feels that his sugar orchard is one of his best pieces of property. It has been estimated that such property pays 10 to 12 per cent. on the investment. Whereas, a few years ago, there was quite a tendency to cut maple trees and clear away the sugar orchards, the present feeling is rather to encourage the extension of the maple sugar industry.

EDITORIAL.

STATE PHARMACEUTICAL ASSOCIATIONS.

June is the month in which the greatest number of State Pharmaceutical Associations hold their meetings. We are always ready to give room to an account of their proceedings, especially when any business of a practical or scientific character is transacted, although we cannot devote the prominence to the "social features" which they receive in many of the associations. Judging from some of the programmes which have been received, the Olympic tendencies have run rampant in a number of the States this year, but it is only a question of time when such excess will effect its own cure.

We do not wish to insinuate the impropriety of a reasonable amount of social entertainment, but we do consider that it is at a considerable sacrifice of dignity when three prizes are offered for every paper read at a meeting, and that these prizes consist of such heterogeneous substances as tooth paste, "listerine" and subscriptions to a drug journal. It does not alter the case to have some of the prizes consist of $10 in gold. No one is going to give much time to a paper which *may* entitle the author to a bottle of essence of pepsin. Papers have been offered at associations in times past that have required months—and, in some instances, years—of patient research. Would the author of such a contribution allow it to compete for a bottle, or a hundred bottles, of some proprietary preparation, which he is required in his daily routine of business to buy and sell without a legitimate profit?

It would be an entertaining mental occupation for a pharmacist to sit down and figure out who finally bears the expense of the numerous prizes offered in the contests at the meeting of a State Pharmaceutical Association. It is not the manufacturer who offers the prize, for it is an advertisement for him or he would not do it; it is not the public, for the numerous members of that class are getting their remedies at wholesale rates; then who is it? Perhaps the pharmacist, who acts as the unwilling distributor without compensation, bears his share of the expense. We have heard much of the profession of pharmacy and of its equality with that of medicine; but what State medical society would waste time at a meeting by devoting it to guessing contests and racing events? The profession of pharmacy will be just what its members make it—no more, no less.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

MISSOURI BOTANICAL GARDEN. SEVENTH ANNUAL REPORT. St. Louis, Mo. 1896. Pp. 209. William Trelease, Director.

The contents of the Report for 1896 consists of Reports for the Year 1895; two Scientific Papers, three Anniversary Publications, four Library Contributions—the Sturtevant Prelinnean Library. Six full-page half-tone plates are distributed through the work, besides sixty-six plates, which illustrate the scientific papers.

According to the Director's report, as many as 30,000 people have visited the Garden on a favorable Sunday in September, thus indicating that it is appreciated by the people of St. Louis.

The Scientific Papers are: "Juglandaceæ of the United States," by William Trelease, handsomely illustrated with twenty-five full-page plates. "A Study of the Agaves of the United States," by A. Isabel Mulford, also fully illustrated. "The Ligulate Wolffias of the United States," by Charles Henry Thompson, illustrated with three plates.

The Anniversary Publication is an address on "The Value of a Study of Botany," by Henry Wade Rogers.

The whole makes a handsome and valuable book, which is published at a price which barely covers the cost of production.

ASEPTOLIN. A formulated treatment for tuberculosis, septicæmia, malaria and la grippe, with reports of cases. By Cyrus Edson, M.D.

A few years ago Dr. Edson would not have been suspected of taking part in an effort to introduce to the medical profession and the public a remedy under a fanciful name, and bearing a trade-mark. His pamphlet of seventy-nine pages is nothing more than a high-sounding advertisement of a preparation, which, if it is constituted as he claims, can be manufactured by any intelligent pharmacist. In order to surround this wonderful remedy with as much mystery as possible, the author has not been satisfied with his own "rough description of the method of manufacture," but has published the results of an investigation by Henry A. Mott, Ph.D., LL.D., who says he has found it to contain "a colorless, crystalline salt, which is new to the medical profession, being a chemical combination of absolutely pure phenol (C_6H_5OH) and the alkaloid pilocarpin. This pilocarpin-phenyl-hydroxide ($C_{11}H_{16}N_2O_2.OH.C_6H_5$)" he says, "exists in Aseptolin, dissolved in an aqueous 2·75 per cent. solution of phenol." Aseptolin, therefore, is composed of:

	Per Cent.
Water	97·2411
Phenol	2·7401
Pilocarpin phenyl-hydroxide	0·0188

Not satisfied with this apparently exhaustive report on its composition, Dr. Mott proceeds to describe the actual process of manufacture in such a lucid (?) manner as to have a deterring effect on the would-be imitator before beginning. After describing the method of preparing a strictly pure phenol by distillation, in which the first and last 10 per cent. are rejected, the exact procedure is given as follows:

"In the preparation of pilocarpin-phenyl-hydroxide, it is only necessary to weigh out an equivalent proportion of this purified phenol solution (after determining its strength by chemical analysis), heat the same to about 100° C. (212° F.), and then gradually add to it an equivalent amount of the pure alkaloid pilocarpin, when, on standing for ten or twelve hours, the uncrystallized pilocarpin-phenyl-hydroxide will separate out. From this salt, Aseptolin may be directly prepared by following the analysis given above. The usual method, however, adopted on an extensive scale, is as follows: The highly purified phenol is diluted with distilled water until the percentage of phenol is reduced to exactly 2·75 per cent., which can be determined by the phenolometer. This is introduced into glass-stoppered receivers, which have been thoroughly cleaned with boiling water. In the receivers the right proportion of the alkaloid pilocarpin is put, so that as the phenol distils over and condenses, it immediately combines with the pilocarpin in the production of Aseptolin. The temperature of the receiver is kept reduced by means of a small stream of water, yet sufficiently high to insure the desired

union, but is never allowed to approach a temperature which would permit of the alkaloid suffering any other chemical change."

All of this is, of course, truly wonderful and appalling to those not familiar with the simplest chemical or pharmaceutical processes. Pharmacists, however, will be surprised only that any one of Dr. Edson's standing should be a party to a trade-mark remedy, and that he could get any chemist to write such drivel. Evidently Dr. Edson knew he was addressing the medical profession, and the record of cases from many physicians indicates that he well understood the weakness of his professional brothers. They will, no doubt, be deeply impressed with the statement that the strength of the purified phenol solution is determined by chemical analysis, and that it is reduced to exactly 2·75 per cent., as determined by the phenolometer.

BULLETIN OF THE NEW YORK BOTANICAL GARDEN, Vol. I., No. 1. The first issue of what will probably become a valuable serial contains the act of incorporation, list of members, officers, etc., constitution and by-laws, reports of secretary and treasurer, and an outline map of the site appropriated by the Commissioners of Public Parks for the Garden.

THE NEWER REMEDIES. A reference manual for physicians, pharmacists and students. By Virgil Coblentz. Second edition. New York. D. O. Haynes and Co., 1896. Pp. 82.

This is a handy reference pamphlet to the almost innumerable new remedies. Plant principles of recent introduction are included, along with synthetic and proprietary remedies. The name, symbolic formula, properties (physical, chemical and medicinal) and dose are given. Pharmacists and physicians will find it a convenient and useful work of reference.

DE LA ECLAMPSIA EN LA MATERNIDAD DE SANTIAGO Y EN ESPECIAL DE LA ECLAMPSIA TARDIA. Por el Dr. Adolfo Murillo. Santiago de Chile, 1896.

UEBER DIE WURZEL VON RUMEX NEPALENSIS, WALL. Von O. Hesse. Reprint from Liebig's Annalen, **291,** 305.

MITTHEILUNGEN AUS DEM PHARMACEUTISCHEN INSTITUTE DER KAISERLICH-JAPANISCHEN UNIVERSITÄT ZU TOKIO, JAPAN. Von Dr. Y. Shimoyama.

This reprint, although issued some time ago, has not previously been noticed in this journal. It contains a number of interesting papers, as follows: "Ueber das Vorkommen des Emodins in den Samen der beiden einheimischen Cassiaarten; Cassia Occidentalis, L. und C. Obtusifolia, L." "Ueber den Emodingehalt der Früchte von Rhamnus Japonica, var. genuina." "Ueber die einheimischen Aconitknollen." "Ueber das in der Japanischen, Zimmtrinde vorkommende Ætherische Oel."

INDEX TO THE ANNUAL REPORTS OF THE U. S. DEPARTMENT OF AGRICULTURE, for the years 1837 to 1893, inclusive. Washington, 1896. By the aid of this report one is able to cover the Government reports on any subject in a very short time, and it will be of the greatest value.

PRICE LIST OF SHARP & DOHME. Baltimore, Chicago, New York. 1896.

PHARMACEUTICAL ASSOCIATIONS.

PENNSYLVANIA PHARMACEUTICAL ASSOCIATION.

The nineteenth annual meeting of this Association took place at Mt. Holly Springs, Pa., June 16th to 19th, inclusive. The early sessions were occupied in the transaction of routine business, such as President's address, reports of delegates and committees. An important departure from the customary sequence of business was made in the case of the President's address, which was postponed to the evening session, when it was delivered as a preliminary to the entertainment given at that time. By this means a much larger audience was obtained than usually attends the first session, and the confusion incidental to new arrivals was avoided.

The reports of delegates were of unusual interest, especially that of those who attended the State Medical Association, this body having extended an invitation to the Pennsylvania Pharmaceutical Association to exhibit a complete set of the National Formulary preparations at their meeting, to be held in Pittsburg, in May, 1897, which invitation was accepted, and a committee appointed to undertake the work.

The Committee on Papers and Queries presented an unusual number of interesting papers, of which the following is a brief summary:

Synthetic oils was the subject of a communication by Joseph Cave, who limited his paper to a consideration of those synthetic compounds which are used in perfumery. He considered that *ionone*, or the perfume of violet, heads the list in importance, and exhibited a specimen of a 10 per cent. solution of it, also one of "violet bouquet," made with it, in which one part of the 10 per cent. solution was mixed with 200 parts of pomade washings of violet, tuberose and jasmin.

Neroli is another synthetic product which the writer considered finer than the natural oil. *Jasmin oil*, *cassia oil* and *lilac oil* were also considered in the paper and samples of them exhibited.

S. H. Hill answered a number of queries offered by the committee. In relation to *pharmacists prescribing*, he thought it the duty of the latter to prescribe some remedy for the immediate relief of pain, but that it is not their place to give any remedy to be taken in continued doses.

In answer to the query concerning the value of the *drummer* to the pharmacist, Mr. Hill reached the conclusion that pharmacy had suffered financially at the hands of the "drummer" because he had encouraged business, that formerly was exclusively the pharmacist's, in other stores and barber shops. In the discussion which followed the reading of this paper, it was evident that the pharmacists present did not agree with Mr. Hill.

The query concerning the *increase or decrease of patent medicines* was answered by the same author, with the statement that the general public is yet brave enough to risk its physical salvation on any cure-all that is judiciously advertised. He, therefore, did not believe the nostrum traffic to be on the decrease.

Mr. Hill also answered the query on the *comparative desirability to the pharmacist of the old-fashioned generator and the present cylinder of compressed carbonic acid gas* with a strong recommendation of the latter. He also believed in *rock candy syrup*, softened rubber by allowing it to soak in

benzin a short time, and preserved oils of orange and lemon by 1 ounce each of alcohol and glycerin to each pound of the oil.

Finally, Mr. Hill offered the following questions and answer: "What, in the opinion of the Association, would be the outcome if pharmacists as a body would refuse to sell any patent medicine which is sold at a cut-rate price? Would it bring manufacturers to terms?" The answer was: "I, for one, have a strong impression that such action would set manufacturers to studying; but to be effectual, the action would have to be entered into by every pharmacist in the United States and Canada."

William B. Thompson contributed a paper on *eminence in pharmacy*, in which he dwelt on the opportunities open to pharmacists who turn their attention to science during spare moments, as illustrated in the lives of Scheele and Runge, a sketch of the latter being given in full.

Mr. Thompson also furnished a paper on the question—*to what extent is a pharmacist justified in prescribing?* in which, after considering the public, the physician and the dispensing proclivities of the latter, he concluded that it would be far better for each one to adhere to his profession.

Emile Ott contributed a *brief history of Scheele and his discoveries.* Also one on *how the microscope can be made valuable to the pharmacist. Rock candy syrup* was the title of a paper by the same author, as well as one on *Hoffman's anodyne.* His conclusion in regard to the latter was as follows:

"As the preparation is principally called for by Germans and German-speaking people, under the circumstances I think the pharmacist is perfectly justified in selling an article made according to the German Pharmacopœia; but he should always keep on hand the standard U. S. P. preparation in cases where it is ordered by the physician, so that he can accommodate all demands."

In regard to cloudiness of *syrup of krameria*, Mr. Ott had found that syrup made according to the Pharmacopœia of 1890 must have as its active ingredient a fluid extract made according to the same authority, and not according to the Pharmacopœia of 1880 or some other unofficial authority.

The same author believed that paregoric could be made just as well from tincture of opium as from the powdered opium; and submitted samples to substantiate his claims. He also had found that *syrup of hypophosphites with iron*, when freshly made as directed by the U. S. Pharmacopœia, is cloudy and only clears after standing some time. By using hot water to dissolve the salts he has always been able to obtain a clear syrup at once.

The *Making of an Herbarium* was the title of a paper by C. B. Lowe (see page 379 of this issue).

Wm. H. McGarrah read a paper advocating a less number of *business hours for the pharmacist.* He believed that this reform might be accomplished if pharmacists would take hold of it in earnest.

Charles H. LaWall presented a contribution on *solid extracts* (see page 366 of this issue).

To what extent is a pharmacist justified in prescribing? has been noticed above as having been treated by two authors. Three more wrote in answer to the same query, namely, John F. Patton, F. W. E. Stedem and D. J. Thomas. All considered it ethically wrong for the pharmacist to exercise the functions of a physician, but claimed there were circumstances under which the knowledge of the former might be put to use, especially in cases of emergency.

Frank X. Moerk contributed two volunteer papers, one on *the detection of acetanilid in some closely related compounds*, and the other on *color tests of some synthetic remedies.* These papers are published in full in this journal, pages 389 and 394.

Notes on assaying gum opium, and the advantage of preparing the tincture of opium from the granulated drug was the title of a paper by Lyman F. Kebler, who strongly advocated the preparation of the tincture by packing 30 per cent. of the drug in a percolator in the usual manner, adding menstruum to cover the drug, and enough more that the remaining material will also be covered, dropping the remaining opium into the percolator, immediately beginning percolation and continuing until 10 per cent. of percolate have been obtained. The opium is always to be covered with the menstruum. After percolating about 10 per cent. of the finished product, the lower orifice is to be closed and the drug allowed to macerate about three hours. Percolation is then continued until another 10 per cent. of the finished product have been secured, and so on, percolating and macerating until exhaustion is complete. The author laid considerable stress on the importance of careful sampling.

J. A. Miller answered the query concerning the *high license law*, by stating that it is his belief that the law is an acceptable one to most druggists, and that it is generally observed. Only two prosecutions had come under his observation, in one of which an old offender was required to pay a fine of $2,500, and suffer imprisonment for eight months. The other case is still pending.

A paper from Louis Emanuel was read on the *comparative value of some extracts of malt and their difference from beer.* This paper is published in full, page 387.

Preliminary education of apprentices and the desirability of an *interchange of certificates between boards of pharmacy*, were subjects ably considered by F. W. E. Stedem in two papers.

John H. Hahn contributed the results of a chemical investigation of *sumbul*, which is published in this journal in full, page 395.

Finally, Emils Ott offered some information concerning an insect which sometimes infects vanilla beans. T. F. Main stated that to his knowledge such beans were never offered by importers as first-class stock, and were always to be had at a lower price than good beans.

After the reading of papers, the Association considered some amendments to the pharmacy law, which were referred to the Committee on Legislation.

The Association also put itself on record as favorable to the adoption of the metric system in the United States, and also as favoring tax-free alcohol for manufacturing and medicinal purposes. Concerning the latter subject, it was realized that such a proceeding amounted to little more than a formality, since the section of the law by which tax-free alcohol was to have been obtained has been repealed.

The following officers were elected: President, Joseph P. Remington; Vice-Presidents, A. R. Durham and C. D. Kiefer; Secretary, J. A. Miller; Treasurer, J. L. Lemberger; Assistant Secretary, D. J. Thomas; Executive Committee, J. H. Knouse, C. L. Hay and G W. Roland. The Kittatinny House, Delaware Water Gap, was selected as the place for the meeting in June, 1897.

The entertainments connected with this meeting were for the most part interesting and instructive in character. The visit to Carlisle on the afternoon

of the 18th was participated in by a large number of members. The features of that event were the inspection of Dickinson College, founded in 1783, and the Indian School. One evening was devoted to a burlesque college examination, in which a number of members acting as students were examined by Prof. Remington and Messrs. Kline and Redsecker. The papers presented as theses by this impromptu class were highly entertaining and in no small degree instructive.

The paper mill and printing office of Mt. Holly Springs came in for a full share of the attention of the visitors. The last day of the meeting was devoted to an excursion to the historic battlefield of Gettysburg.

THE CALIFORNIA PHARMACEUTICAL SOCIETY.

The annual meeting of this Society was held in San Francisco, at the College of Pharmacy Building, May 29, 1896.

The attention of the meeting was chiefly occupied with trade interests. This was in accordance with the previously arranged plan to administer the affairs of the Society separately from those of the California College of Pharmacy. The Society, therefore, considered such subjects as "The Patent Medicine Evil," "The Best Way of Dealing with Cutting on Proprietary Articles," and "How to Improve the Drug Business."

The loss of profits on patent medicines has been a severe blow to the pharmacists of that State, and the members of the Society were very much in earnest in their determination to remedy the evil. It was proposed to establish a manufactory by the Society and make a line of cough mixtures, liniments, alteratives, tonics, etc., to replace those produced by nostrum makers. This plan, it was thought, would doubly aid the pharmacist, though it would be severe on the wholesale druggist and the manufacturer. A committee was appointed to put the plan into operation.

THE INDIANA PHARMACEUTICAL ASSOCIATION.

This Association met in Indianapolis, June 3, 1896. President Moffett, in his address, recommended the employment, at a fixed salary, of a State organizer, in order to bring all the pharmacists of the State into membership, and thus form a body that could effectually deal with "cutters" and those who supply physicians with remedies ready for dispensing. This suggestion was, at a later session, adopted by the Association. One paper was read; it was entitled, "The Examination of Powdered Gamboge," and was by Mr. E. G. Eberhardt (see page 371 of this journal). Addresses were made by Prof. J. M. Good, of St. Louis, and Dr. J. F. Hibberd, of Richmond, Ind. The proposed pharmacy law was the chief subject discussed by the Association, and a preliminary draft of a bill was read and considered. The following officers were elected: President, Otto Gross; Vice-Presidents, Brune Knoefel, John Kennedy and Thomas Thornberg; Secretary, Arthur Timberlake; Treasurer, Grant Allen; Executive Committee, E. H. Burton, Charles Eichrodt and S. Muhl. The Association will meet in Indianapolis next year.

MISSOURI PHARMACEUTICAL ASSOCIATION.

The eighteenth annual meeting of the Missouri Association was held at Excelsior Springs, Mo., June 9th to 12th, 1896. In the address of the President,

J. M. Love, the U. S. Pharmacopœia and the National Formulary came in for a full share of consideration, and free alcohol was recommended.

The following papers were read and discussed: "Process for Spirit of Nitrous Ether, with Practical Demonstration," by Prof. David Walker; "What Shall We Do to Induce the Druggists to Become Members of, and Attend the Meeting of, the A. Ph. A. and the M. Ph. A.?" by A. N. Doerschuk; "How to Prevent the Cutting of Prices on Patent and Proprietary Medicines," by T. A. Moseley; "Semi-proprietary or So-called Elegant Preparations," by C. E. Corcoran; "The Future of Pharmacy in the United States," by A. N. Doerschuk; "The Professional and Business Aspects of Pharmacy," by T. A. Moseley; "Semi-proprietary or So-called Elegant Preparations," by R. J. Brown, of Leavenworth, Kas.; "Semi-proprietary or So-called Elegant Preparations," by J. M. Love; "Hints for the Benefit of the M. Ph. A.," by Ambrose Mueller; "Problems in Organic Chemistry," by Prof. J. M. Good; "Eighteen Years of Pharmaceutical Reminiscences in Missouri," by F. R. Dimmitt; "Methods of Detecting Drug Adulterations, with Illustrations," by Prof. Francis Hemm; "A New Method of Preserving Fruits and Flowers," by John Wright, of Indianapolis, Ind.

Prizes were awarded for papers as follows: Francis Hemm, $10 in gold, from the J. S. Merrell Drug Company; A. N. Doerschuk, $5 in gold, from the J. S. Merrell Drug Company, also a sponge case from Woodward, Faxon & Co.; Ambrose Mueller, a copy of the Era Formulary, from the publisher; David Walker, one dozen Listerine, from the manufacturer; C. E. Corcoran, one pair fine counter scales, from Henry Troemner, also fifty pounds of glycerine, from W. J. M. Gordon; J. M. Love, $5 in gold, from the J. S. Merrell Drug Company; J. M. Good, copy of the U. S. Dispensatory, from Meyer Brothers, druggists.

The Association adopted a resolution urging all institutions teaching pharmacy to require satisfactory evidence from each applicant for the degree of Ph.G., showing at least four years' time served in a drug store under the direction of a competent pharmacist.

The following officers were elected: President, Eugene Soper; Vice-Presidents, F. W. Sennewald, Dr. D. K. Morton, W. R. Scheldrup; Secretary, Dr. H. M. Whelpley; Treasurer, William Mittelbach; Assistant Secretary, Ambrose Mueller; Local Secretary, Thomas Layton; Members of the Council, J. M. Good, J. M. Love, R. E. Maupin, C. E. Corcoran and Miss Fredrica De Wyl.

Meramec Highlands, June 22, 1897, was selected as the place and time for the next annual meeting.

Professor John Attfield has resigned the chair of practical chemistry in the Pharmaceutical Society of Great Britain, after thirty-four years of service. The Council of the Society accepted his resignation on June 3d, and passed appropriate resolutions in recognition of his services. Professor Attfield is 64 years of age, and has in one way or another been identified with the Society ever since he became one of its early pupils. He is known best in this country by his text-book on chemistry, although his other literary work is of considerable importance, he having edited the last edition of the British Pharmacopœia, and is at present engaged on a new edition of that work.

THE AMERICAN
JOURNAL OF PHARMACY

AUGUST, 1896.

A CONTRIBUTION TO THE KNOWLEDGE OF SOME NORTH AMERICAN CONIFERÆ.

By Edson S. Bastin and Henry Trimble.

(*Continued from page 386.*)

PICEA ALBA, LINK.

CHEMICAL COMPOSITION.

The leaves, stem bark and root bark of a white spruce tree, cut in March, 1896, were subjected separately to a proximate analysis. The following are the percentage results on the moisture, ash and tannin:

	Moisture.	Ash in Absolutely Dry Sample.	Tannin in Absolutely Dry Sample.
Leaves	8·26	5·29	7·89
Stem bark	8·17	4·11	21·63
Root bark	8·72	9·81	19·09

The ash in each was found to contain potassium, calcium and iron, combined with phosphoric, sulphuric and carbonic acids.

The foregoing portions, treated with absolute alcohol, yielded the following percentage results to that menstruum:

Leaves	24·99
Stem bark	33·25
Root bark	33·49

These respective portions, when treated with petroleum ether, yielded the following percentage amounts of the original material, indicating that amount of fat, wax, fixed and volatile oils dissolved by that solvent:

Leaves	3·91
Stem bark	3·62
Root bark	2·81

These figures, deducted from those given for the total amount extracted by absolute alcohol, indicate the amount of resin and tannin.

The residual insoluble portions from the treatment with absolute alcohol were treated separately with water, to which they yielded considerable quantities of glucose and mucilage.

Tannin was separated from the bark of the root and stem separately, and the ultimate analyses of them indicated that they belong to the same class as those already found in this natural order of plants, and to those derived from oak bark. A larger amount was then prepared from the mixed stem and root barks, so as to admit of more thorough purification, and submitted to combustion, when the following percentages were obtained:

Carbon	59·99
Hydrogen	6·74

The qualitative reactions of this tannin likewise indicated that it belonged to the oak bark group, according to the following:

Ferric chloride gave green color and ppt.
Bromine water gave yellow ppt.
Calcium hydrate gave light ppt., turning brown.

ECONOMICS.

The wood of this tree is straight-grained, light yellow in color, soft and light, and not very strong. It is to a considerable extent made into lumber, and is somewhat employed in making spars and masts of vessels. The fibres of the roots are very tough, and, when macerated in water, deprived of their bark, and split, are employed by the Indians of the North in stitching their birch-bark canoes.

PICEA NIGRA, LINK.

BLACK OR DOUBLE SPRUCE.

DISTRIBUTION AND GENERAL CHARACTERS.

This species, from its dark-colored stem and branches, is commonly called the black spruce. It occurs in Labrador, the Hudson

Bay region, about the mouth of the Mackenzie River, throughout Canada, along the eastern slopes of the Rocky Mountains, and in the northeastern portion of the United States. It occurs as far south as Pennsylvania and Central Michigan. It is a moderate-sized tree, attaining a height of not more than about 70 feet, and a diameter of not more than 3 feet. It favors light and rocky soil, and

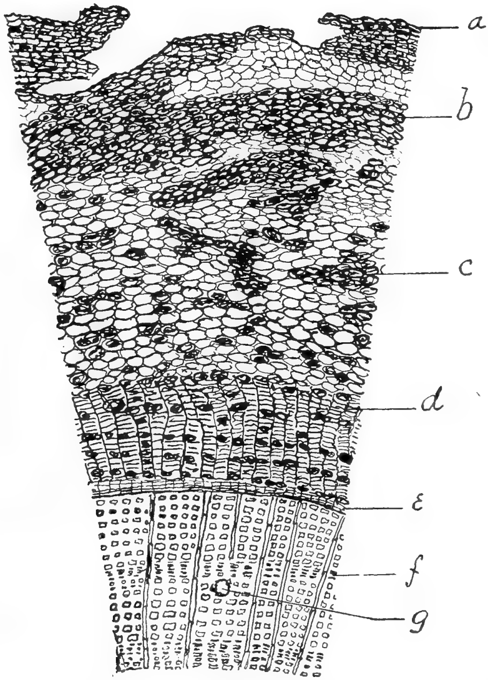


Fig. 40.—Cross-section from stem, several years old, of Picea nigra, magnified 75 diameters. *A* and *b*, periderm layers, rich in tannic and coloring matters; *c*, tannin cells in cortex; *d*, bast layer; *e*, cambium zone; *f*, ring of growth; *g*, secretion reservoir in xylem.

hilly or mountainous localities. It is one of the commonest of the evergreens of our northern forests.

This species differs from P. alba in having its branches pubescent, its leaves thicker and usually dark green or but slightly glaucous, and its cones ovate, and with denticulate scales. The trunk is smooth, straight, gradually tapering from base to apex. The bark is smooth and the branches horizontal.

MICROSCOPICAL STRUCTURE.

A twig of several years' growth, from which the epidermis and exterior parts of the primary cortex had disappeared, was studied microscopically. The superficial periderm layers, composed partly of stone cells and partly of thin-walled cells, contained much tannin and coloring matter. The sublying cortical layers contained many tannin and crystal cells, some cells enclosing brown coloring matter, and a few stone cells. The bast layer was destitute of bast fibres, and, like P. alba, had its numerous rather large tannin cells arranged in tangential rows. There were a few secretion reservoirs in the bark. The wood was similar in structure to that of P. alba, but the secretion reservoirs were few and small. Tannin was observed to be present in the medullary ray cells of the wood.

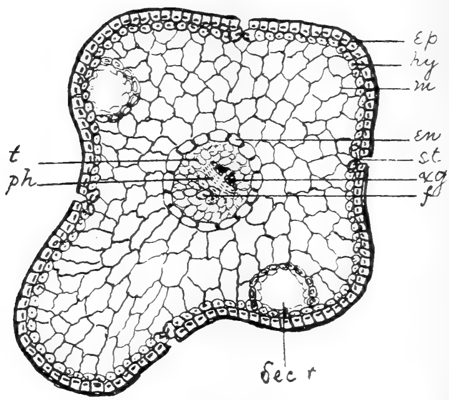


Fig. 41.—Cross-section of leaf of Picea nigra, magnified 75 diameters. *Ep*, epidermis; *hy*, hypoderma; *m*, mesophyll; *en*, endodermis; *st*, stoma; *xy*, xylem of fibro-vascular bundle; *f*, fibres at the outer margin of the phloem, *ph*; *t*, transfusion tissues.

The leaves of this species are from ½ inch to ⅝ inch long, and $\frac{1}{35}$ inch in diameter, abruptly pointed, usually curved, quadrangular-prismatic, possessing from three to five more or less interrupted rows of stomata on each side. The epidermis was observed to be composed of small, very thick-walled cells, and the hypoderma of one layer of thick-walled cells. The mesophyll was composed of wavy-walled parenchyma, the central bundle was small, distinctly double, and had at the outer border of the phloem a few thick-

walled fibres. The layer of transfusion tissue was moderately thick, the endodermis large-celled, and the radial walls of its cells were thickened. The secretion reservoirs, which were located at the lateral angles, were of moderate size.

CHEMICAL COMPOSITION.

Owing to the similarity in most particulars of the white and the black spruces, and the absence of sufficient material at a convenient time, a detailed chemical study was not made of the latter. A sample of bark from a branch, collected in the Adirondack Mountains, New York, in August, 1895, yielded the following percentage results:

Moisture	9·95
Ash in absolutely dry bark	2·72
Tannin in " " "	12·13

The fact that this sample was from a branch, and collected late in the summer, would account for the lower percentage of tannin than that yielded by the white spruce.

There is another constituent of considerable importance in the black spruce, although it has not been studied by us, and that is the resinous exudation, popularly known as *spruce gum*. In 1886 Menges[1] contributed an article of considerable interest on this subject. He showed that it is obtained from the black spruce, although small quantities are yielded by the white spruce. None, however, is obtained from the hemlock spruce, Tsuga Canadensis, as is frequently reported.

The spruce gum is not obtained by hacking or puncturing the trees, but exudes spontaneously from decayed knots, or seams caused by extremes of heat and cold. Simply bruising the bark will not cause a flow of the resin, but the cavity must extend through the bark and sapwood.

The so-called gum is collected during the winter season by men on snow-shoes, who are provided with a small tin cup attached to a chisel and long pole, so that, as the mass of resin is cut off, it drops into the cup.

The largest quantities are collected in Maine, New Hampshire, Vermont and Canada.

---

[1] Examination of the So-called Spruce Gum. Adolph F. Menges. *Contrib. Dep. Phar., University of Wisconsin*, 1886, p. 30, and AMER. JOUR. PHAR., 1886, p. 394.

On distillation with water or steam, the resin of spruce yields a volatile oil, which boils at 160° and appears to be composed almost entirely of terpene, $C_{10}H_{16}$. The residual resin, after removal of volatile oil, was found by Menges to be soluble in alcohol, methyl alcohol, ether and chloroform, sparingly soluble in benzol and insoluble in petroleum ether; it did not afford crystals of abietic acid when digested with alcohol of 0·890 specific gravity, thus differing from colophony; and when treated with dilute nitric acid it yielded picric acid, whereby it further differed from colophony.

ECONOMICS.

The wood of this tree is rather compact, straight-grained, soft and light, usually reddish in color, and, though not very strong, is, by reason of its lightness and elasticity, much used in construction. It is largely used for spars, the knees of vessels, the rafters of houses, railway ties, and for manufacture of lumber. The twigs are also employed for brewing spruce beer, which, in the northeastern part of the United States and in Canada, is regarded as a wholesome drink.

PICEA PUNGENS, ENGELMANN.

COLORADO BLUE SPRUCE.

DISTRIBUTION AND GENERAL CHARACTERS.

The blue spruce is western in its range, being found in the mountains of Colorado, Wyoming and Utah. In favorable situations it becomes a large tree, attaining a height of 150 feet, and a diameter of 3 feet. It does not, like the two species just considered, form large forests, but is rather rare or of local occurrence. The species has a thick, smooth, gray bark, which, on old stems, is fissured. Its branches are horizontally spreading, and its branchlets are smooth and glossy. Its cones are solitary or clustered, cylindrical, drooping, light brown in color, and 2½ to 5 inches long. The scales are oval, more or less undulate, margined and retuse.

MICROSCOPICAL STRUCTURE.

A cross-section of the stem of two years' growth showed the following structure: an epidermis of thick-walled cells, supported by two or three layers of thick-walled hypodermal cells. Beneath this was a thin-walled parenchyma, similar to that described in the other two species. Bounding this on the interior was the periderm layer,

rich in tannin, and containing also crystals of calcium oxalate. The thick layer of parenchyma interior to this contained only a resin passage, numerous scattered resin cells, and some cells containing crystals of calcium oxalate. In the bast layer were tannin cells,

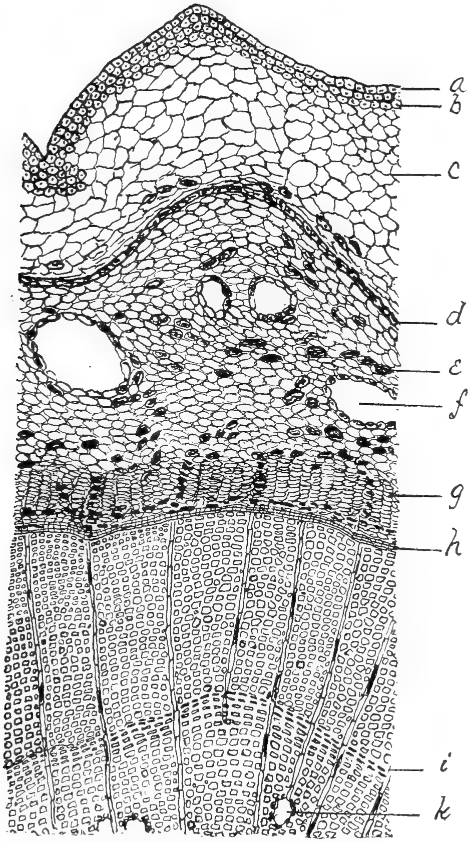


Fig. 42.—Cross-section from stem, two years old, of Picea pungens, magnified 75 diameters. *A*, epidermis; *b*, hypoderma; *c*, thin-walled parenchyma, containing but little tannin, except in its inner layer; *d*, periderm layer; *e*, tannin cell in cortex; *f*, secretion reservoir; *g*, bast layer of bark; *h*, cambium zone; *i*, ring of growth; *k*, secretion reservoir in xylem.

arranged as in the other species, in tangential rows. A small amount of tannin was noticed in the medullary ray cells and about the secretion reservoirs in the wood. In other respects the xylem presented no important peculiarities.

A very few stone cells were observed in the bark.

The leaves are sessile, four-sided and four-angled, glaucous, very sharp-pointed, ¾ inch to 1 inch long, and $\frac{1}{25}$ inch thick. On each face were observed four more or less interrupted rows of stomata. The epidermis was composed of one layer of small, thick-walled cells, the hypoderma also of a single layer of thick-walled cells, and the mesophyll of wavy-walled cells. The secretion reser-

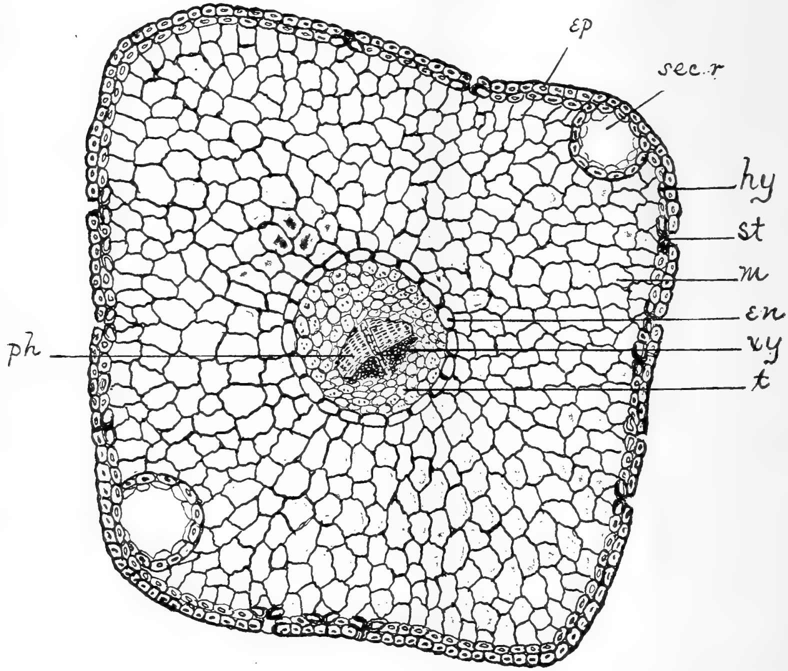


Fig. 43.—Cross-section of leaf of Picea pungens, magnified 75 diameters. *Ep*, epidermis; *hy*, hypoderma; *sec. r.*, secretion reservoir; *st*, stoma; *m*, mesophyll; *en*, endodermis; *xy*, xylem; *t*, transfusion tissue; *ph*, phloem.

voirs at the lateral angles were of rather large size. The central fibro-vascular bundle was double, of small size, enveloped by a rather copious transfusion tissue, and this, in turn, was surrounded by distinct, rather large-celled endodermis.

CHEMICAL COMPOSITION.

From a good-sized nursery specimen grown in Pennsylvania, we have been able to make some examination of the constituents in

the bark of the stem and roots of this species. The material was collected in June.

The moisture, ash and tannin were first estimated in separate portions, with the following percentage results:

	Moisture.	Ash in Absolutely Dry Bark.	Tannin in Absolutely Dry Bark.
Stem bark	10·47	4·21	8·66
Root bark	10·65	5·03	17·51

The constituents of the ash in both were found to be potassium and calcium, combined with phosphoric and carbonic acids.

The stem bark yielded to absolute alcohol 17·43 per cent. of oleoresinous extract, of which an amount representing 3·59 per cent. of the original drug was found to be soluble in petroleum ether, and consisted of volatile oil, resin and wax. The remaining 13·84 per cent. of the alcoholic extract consisted of resin and tannin, from which, by deducting the tannin, we obtained 5·18 per cent. of resin. In the same manner we found in the root bark 26·37 per cent. of total absolute alcohol extract, 3·30 per cent. of volatile oil and wax, and 5·56 per cent. of resin.

The aqueous extraction of the residual bark, after treatment with absolute alcohol, yielded considerable amounts of mucilage and glucose.

A quantity of the tannin was prepared from the root bark, purified and submitted to elementary analysis, with the following percentage results:

Carbon	59·44
Hydrogen	5·72

These figures, with the behavior towards iron salts and bromine water, indicate that the tannin of the blue spruce belongs to the oak bark group.

ECONOMICS.

The wood of this species is very similar in its texture to that of the other spruces already described. Its chief use at the present time, so far as we know, is as an ornamental tree for parks and lawns, for which purpose, on account of its beautiful color and compact habit, it is especially adapted.

PICEA EXCELSA, LINK.

NORWAY SPRUCE.

Although not originally a native of the Western Continent, the Norway spruce has become so firmly established in this country as to make its consideration along with our own species of especial interest. It is one of the largest and finest of its genus, attaining a height, in some cases, of 180 feet and a diameter of 6 feet.

It is of conical form; its lower branches are drooping; the bark of the trunk is rather thin, warty, of a reddish-brown color and becoming scaly on old trees. The cones are cylindrical, terminal, pendant; its scales are naked, flattish and truncate at the apex. The cones are large, from 5 to 7 inches long, and from 1½ to 2 inches thick.

The species is widely distributed over the cooler portions of Europe and Asia. It is common in Scandinavia, Lapland, Denmark, northern Germany, the Alps (where, at an elevation of 4,000 to 6,500 feet, it comprises vast forests), Russia and Siberia.

MICROSCOPICAL STRUCTURE.

A cross-section of the stem of two years' growth showed the following structure: The thick-walled epidermis was supported by only about one layer of thick-walled fibres. Beneath this were several layers of thin-walled, large-sized parenchyma cells. Interior to this was a layer of periderm, consisting partly of stone cells and partly of thin-walled cells abounding in tannin. Interior to this was a considerable thickness of parenchyma, containing some oleoresin cells and numerous tannin cells. In this area also occurred occasional crystal cells, similar to those whose occurrence has been noted in other species of Picea and Pinus. No stone cells were observed interior to the periderm layer. The bast layer was without fibres and contained numerous small tannin cells. The xylem had the usual structure and contained but little tannin.

The leaves of this species are from $\frac{1}{2}$ to $\frac{3}{5}$ inch in length and $\frac{1}{30}$ inch thick, quadrangular, prismatic, pointed, rigid, deep green, and were observed to have from three to five more or less interrupted rows of stomata in each face. The epidermis was composed of small cells, with thick and strongly cutinized exterior walls, and with but moderately thickened inner and radial walls. The hypoderma was, at the angles, two-layered, elsewhere one-layered, and was composed of thick-walled cells. The mesophyll was composed of

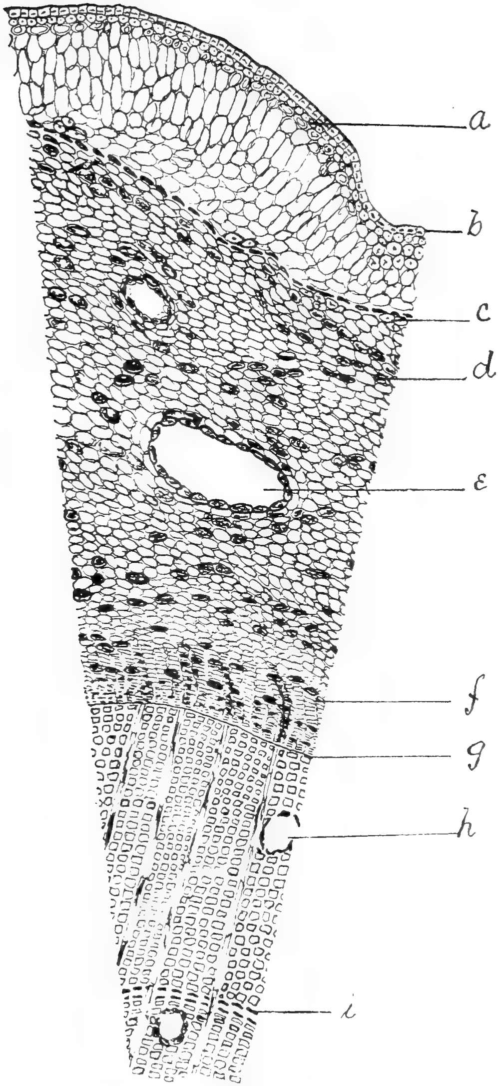


Fig. 44.—Transverse section from stem, two years old, of Picea excelsa, magnified 75 diameters. *A*, hypoderma; *b*, epidermis; *c*, periderm layer in formation—its cells rich in tannin; *d*, tannin cell in cortex; *e*, secretion reservoir; *f*, bast layer of bark; *g*, cambium zone; *h*, secretion reservoir in xylem; *i*, ring of growth.

wavy-walled cells, which abounded in tannin. The endodermis was similar to that of the other species described; the transfusion tissue was copious and of the usual character; the fibro-vascular bundle was double, and at the exterior side of the phloem was a mass of thickish-walled and lignified fibres.

CHEMICAL COMPOSITION.

The specimen from which the barks of the stem and root were taken was collected near Philadelphia in May. The moisture, ash and tannin were estimated, and the following percentage results obtained:

	Moisture.	Ash in Absolutely Dry Bark.	Tannin in Absolutely Dry Bark.
Stem bark	11·37	4·98	15·40
Root bark	11·32	6·11	15·39

A quantity of the tannin was prepared from the root bark by means of acetone, and purified. Its elementary analysis yielded the following percentage results:

Carbon	60·81
Hydrogen	6·00

There is no doubt that this tannin is identical with those obtained from the other species of Picea, as well as with that from oak bark. The percentages of hydrogen found in all the spruce tannins are nearly 1 per cent. higher than the average found in most other tannins of the oak bark group, but this is accounted for by the presence of adhering resin, which it is almost impossible to separate entirely, and which contains, in many cases, nearly twice as much hydrogen as exists in the tannin.

The most important constituent of the Norway spruce is the resin, known as Burgundy pitch. The largest proportion of this resin is collected in Finland, smaller quantities are produced in southern Germany and Switzerland. None was ever produced in Burgundy. It is collected by making longitudinal incisions, somewhat after the manner of turpentine. The products consist of resin, volatile oil, similar to oil of turpentine, and water. The resin

is purified by melting and straining through straw. When heated sufficiently long it is deprived of all of its volatile oil and water, and becomes clear and of a brown color. The composition of the resin has not been studied, but it is said to consist largely of abietic acid, and thereby closely resembles the resin of turpentine.

ECONOMICS.

The wood of this species is elastic, light, not very strong, and varies in its durability according to the soil in which it grows. The

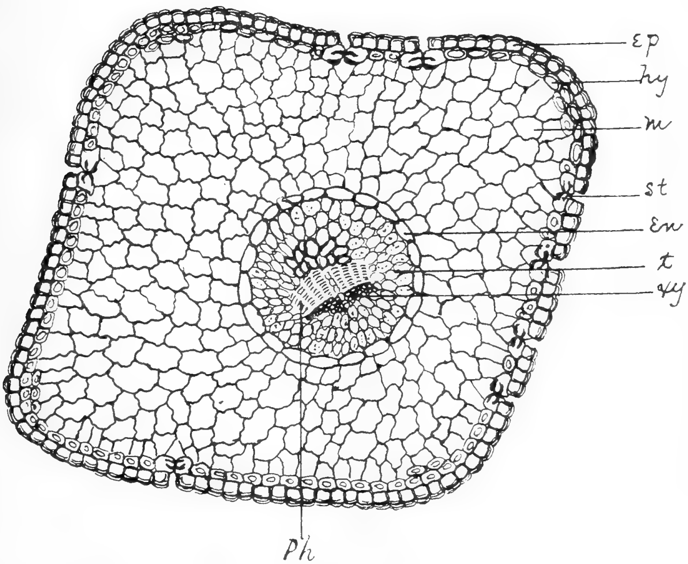


Fig. 45.—Cross-section of leaf of Picea excelsa, magnified 75 diameters. *Ep*, epidermis; *hy*, hypoderma; *m*, mesophyll; *st*, stoma; *en*, endodermis; *t*, transfusion tissue; *xy*, xylem of bundle; *ph*, phloem of bundle. This section does not happen to show the secretion reservoirs often found at the lateral angles of the leaf.

bark is employed for tanning. The buds and young shoots are employed, like those of P. nigra, for the purpose of brewing a beer. The wood is also extensively used in construction, for ladders, spars, oars, the masts of vessels, and for sawing into lumber which is used for a great variety of purposes.

The wood is fine-grained and takes a high polish, and hence is much employed in the cabinetmaker's art and in the construction of musical instruments.

It is known in England under the name of *white deal.*

In recent times the wood of the Norway spruce has come into extensive use for manufacture into paper. The exports of wood pulp, mostly from this tree, from Norwegian ports—part of which is Swedish produce—amounted, in 1893, to 230,000 tons.

(*To be continued.*)

ON THE CHEMICAL COMPOSITION OF BISMUTH SUBNITRATE.

By Lyman F. Kebler.

Having been investigating the chemical composition of the bismuth subnitrate in our markets for some time, the writer naturally read the excellent communication on this subject, by the late Dr. Curtman,[1] with much interest. Since the results obtained by the writer differ, in some respects, from those reported by Dr. Curtman, it will be interesting to record them. For conditions affecting the composition of this article the reader is referred to Dr. Curtman's paper, Dammer's "Handbook," or any other extensive chemical treatise.

The first obstacle met with in the work was to differentiate between the amount of moisture mechanically retained and the per cent. of chemically combined water. The Pharmacopœia states: "When heated to 120° C., the salt loses water (between 3 and 5 per cent. of its weight)." No time is specified. Is it to be understood that this indicates the mechanically retained moisture or both? In order to obtain some data on the subject, the following experiments were made: A weighed quantity of good bismuth subnitrate[2] was placed in a desiccator containing strong sulphuric acid, and the total percentage of loss for the entire time noted every twenty-four hours, with one exception: 1st day 0·87, 2d 0·96, 3d 0·96, 4th 1·19, 5th 1·19, 7th 1·26, 8th 1·30, 9th 1·30, 10th 1·30, 11th 1·31, 12th 1·32.

Next, given weights of ten samples were simultaneously dried in an air bath, at 90° C., for 2, 8 and 24 hours, and the total loss noted at the end of each interval of time. Drying was then continued at

---

[1] 1896, *Am. Druggist*, **28**, 8; *Pharm. Era*, **15**, 43; *Pharm. Review*, **14**, 12.

[2] No. 9 in tables below.

100° C. for 8 hours. The temperature was now raised to 120° C., and the total loss taken at intervals of 4, 14 and 34 hours, and finally drying was continued at 140° C. for 16 hours. The results were as follows:

Number.	Physical Appearance.	Microscopical Appearance.	Per Cent. of Moisture at 90° C., 2 hours.	Per Cent. of Moisture at 90° C., 8 hours.	Per Cent. of Moisture at 90° C., 24 hours.	Per Cent. of Moisture at 100° C., 16 hours.	Per Cent. of Moisture at 120° C., 4 hours.	Per Cent. of Moisture at 120° C., 14 hours.	Per Cent. of Moisture at 120° C., 34 hours.	Per Cent. of Moisture at 140° C., 16 hours.
1 . . .	Bulky.	Crystalline.	1·04	1·18	1·23	1·26	1·83	2·30	3·25	5·63
2 . .	"	"	0·70	0·89	0·98	0·98	1·21	1·70	2·23	2·76
3 . . .	"	"	0·61	0·94	1·03	1·08	2·43	2·51	3·19	4·23
4 . . .	"	"	1·08	1·11	1·23	1·33	1·88	3·65	4·01	4·07
5 . . .	Moderately heavy.	Amorphous and Crystalline.	0·35	0·83	0·94	0·97	1·15	1·68	2·37	3·39
6 . . .	Bulky.	Crystalline.	0·93	1·12	1·19	1·23	2·55	2·81	3·39	3·63
7 . . .	"	"	0·81	1·09	1·20	1·24	2·13	2·77	3·26	3·57
8 . . .	"	"	1·04	1·16	1·20	1·21	2·73	2·85	3·93	3·93
9 . . .	"	"	0·98	1·19	1·31	1·31	3·03	3·94	3 95	4·04
10 . . .	Heavy.	Amorphous.	0·26	0·80	0·84	0·84	0·84	1·12	2·05	2·35

In general, when drying in a desiccator over sulphuric acid is sufficiently prolonged, all of the mechanically retained moisture is abstracted. The same holds true when a substance is heated for a sufficient length of time at 100° C. From the fact that the amount of moisture obtained by these two procedures agree so closely, we might infer, on the one hand, that it represented all of the moisture mechanically retained, and that a portion of the loss at 120° C. is due to water chemically combined. On the other hand, microscopical examinations show that the crystals, after having been heated at 120° C. for 34 hours, had not suffered any disintegration. The small loss may, however, not affect the structure of the crystals. The above results will not admit of absolute conclusions, consequently the amount of water lost at 120° C. is taken as a basis of future calculations for ready comparisons.

Two sources of information are still left us: (1) the per cent. of

metallic bismuth, and (2) the per cent. of combined nitric acid. These were estimated in the ten samples examined above with the following results:

Number.	Per Cent. of Bismuth Oxide.	Per Cent. of Nitric Acid Radical (NO_3).	Per Cent. of $BiONO_3$, H_2O. Calculated from NO_3.
1	83·23	18·78	92·09
2	81·26	18·38	90·14
3	81·46	17·88	87·69
4	83·26	18·44	90·43
5	82·50	14·12	69·25
6	81·00	17·76	87·10
7	81·15	17·70	86·81
8	81·36	18·76	92·00
9	81·02	19·21	94·21
10	83·01	19·68	96·51

The bismuth oxide was determined by ignition in the usual way. Any mixture of bismuth subnitrate and bismuth hydroxide would not vary materially in the percentage of bismuth oxide from the above results, consequently this source of information is of little value as regards the amount of bismuth subnitrate.

Several methods were tried for estimating the combined nitric acid. The necessary apparatus for the absolute or copper oxide method was not at the writer's disposal. Gunning's method, modified for nitrates,[1] gave unsatisfactory results, being non-concordant and low. This was undoubtedly due to a loss of nitric acid, encountered when the sulphuric-salicylic acid mixture was added to the bismuth subnitrate. The odor of nitric acid was pronounced at the mouth of the digestion flask. The method employed by Dr. Curtman did not yield satisfactory results in the writer's hands. The end reaction was difficult to determine, on account of the reflection of the pinkish-colored precipitate, and the results were even lower than those obtained by Gunning's process. The volumetric method giving the writer the most satisfactory results is as follows: Suspend any given weight of the salt in about 10 equivalents of distilled water, in a suitable beaker; add an excess of normal potassium hydroxide and a few drops of phenolphthalein solution; bring the

[1] 1895, "Methods of Analysis, Association of Official Agricultural Chemists," p. 18.

contents of the beaker to a brisk boil, and re-titrate the excess of potassium hydroxide. From the results thus obtained, the per-cent. of the combined nitric acid radical can readily be calculated. The results recorded above may be a trifle low, since it is well known that bismuth subnitrate is with difficulty completely decomposed with dilute alkaline solutions, even at the boiling point.

The samples were taken from original packages. The U. S. Pharmacopœial requirements were complied with in every respect, except that from an appreciable quantity to a minute trace of chlorides was present in every case, and No. 5 was contaminated with the carbonate.

The above results show that the bismuth subnitrate manufactured in Philadelphia, New York and Brooklyn, although not a theoretical chemical compound, is not so excessively "basic" as those reported on by Dr. Curtman, excepting No. 5.

PHILADELPHIA, PA., July, 1896.

THE VALUATION OF GRANULAR EFFERVESCENT POTASSIUM BROMIDE WITH CAFFEINE.

By CHARLES E. ALEXANDER, PH.G.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy. No. 155.

In order to estimate the medicinal constituents of granular effervescent potassium bromide with caffeine, the writer has devised and used the following methods with gratifying results:

One gramme of the preparation is dissolved in about 30 c.c. of water, the solution acidified with nitric acid, warmed, and, while constantly stirred, completely precipitated with silver nitrate test solution. The precipitate of silver bromide may be mixed with silver chloride from soluble chlorides in the original preparation. It is, therefore, collected on balanced filters, washed thoroughly with hot water, and afterwards treated on the filter with a 10 per cent. solution of ammonium carbonate, applied in small quantities and uniformly distributed, to dissolve silver chloride. The precipitate is then washed free of ammonium carbonate with cold water, and dried to constant weight at a temperature not exceeding 130° C. The amount of potassium bromide is then calculated by proportion from the weight of silver bromide found.

If it is desired to estimate the chlorides that may have been present in a sample of the granular salt, the filtrate obtained by treating the precipitate with ammonium carbonate can be acidified with nitric acid, the mixture heated, and any precipitate obtained collected on balanced filters, dried like the silver bromide, and weighed.

To estimate the caffeine, 5 grammes of the salt are placed in a mortar and triturated with 3 c.c. of official solution of ferric chloride; then sufficient sodium bicarbonate is added to make a magma and impart an alkaline reaction (about 3·5 grammes). Twenty c.c. of chloroform are then thoroughly rubbed through the magma with the pestle and decanted into a weighed beaker. Two other portions of chloroform, of 10 c.c. each, are then applied to the magma in succession, and likewise transferred to the same beaker. The united chloroformic washings are then carefully evaporated, or distilled off, and the beaker kept in a boiling water bath until the weight is constant.

According to the National Formulary, granular effervescent potassium bromide with caffeine should contain 11·11 per cent. of potassium bromide and 1·11 per cent. of caffeine; but on investigating three of the prominent preparations, which are now placed on the market by as many manufacturing houses, I found them to vary widely from these amounts. One of the samples was not at all uniform, and required to be powdered before the results of duplicate analyses agreed. This suggested imperfect mixing of the materials before granulating the mass, a fault which may, to some extent, account for the great variation of the salts from standard.

The chlorides present did not exceed in any case the amount of potassium chloride allowed by the Pharmacopœia in potassium bromide.

The loss on drying the salts at 90° C. was but 1·1, 1·2 and 1·0 per cent. of their weight.

The results for the medicinal constituents were the following percentages:

Sample.	Potassium Bromide.	Caffeine.
1	17·43	·22
2	8·74	1·50
3	6·08	·36

SOLUTION OF LEAD SUBACETATE.

By Edward M. Post, Ph.G.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy, No. 156.

This official preparation was introduced into the practice of medicine under the name of *Extractum Saturni*, in 1770, by Thomas Goulard, who was at that time a surgeon-major of the military hospital at Montpellier, France. From the outset the preparation received a prominence which time has served to strengthen, until, at the present time, the article has a universal reputation of favor. Though this solution has been prominent and widely known for so long, the method of its preparation seems to have had but little consideration, if we judge from the few suggestions for improvement of that process. But some of these suggestions are very worthy of attention, and the object of the experimental work herein recorded was to test the claims of the following references:

Hennig suggested, in the *Pharm. Cent. Halle*, for 1869, p. 162, to make the preparation by cold digestion of lead oxide with lead acetate solution for twenty-four hours. Of the same order was the suggestion of M. Nerning, as published in the *Jour. de Pharm. et de Chimie*, for 1870, at which time the editor, in a note, stated, with reference to this process, that it had long been adopted in the military hospitals, the following being the proportions of ingredients used: crystallized acetate of lead, 300 parts; litharge, in fine powder, 100 parts; distilled water, 650 parts. Put them into a bottle, shake them from time to time, and, at the expiration of six or eight hours, filter.

In Squire's "Companion to the British Pharmacopœia," sixteenth edition, 1894, we find the note: "Digestion in the cold for a week answers equally well if not better than the half-hour's boiling."

The quantities directed by the British Pharmacopœia are: lead acetate, 250 gm.; lead oxide, 175 gm., and water to make 1,000 gm. The Pharmacopœia of this country orders that 170 gm. of lead acetate be dissolved in 800 gm. of boiling distilled water, and that 100 gm. of finely sifted lead oxide be added, the whole boiled for half an hour, replacing from time to time the water lost by evaporation, and, after cooling, adding sufficient water to bring the weight up to 1,000 gm. The product is finally filtered.

The British directions include constant stirring of the boiling solution, something that every skilled pharmacist would do in following the outlined process of the United States Pharmacopœia.

Now, if the suggestions cited above yield good products, a large part of the time and attention bestowed upon the official process may be saved.

A quantity of lead oxide and acetate sufficient to make a number of samples was procured and tested according to the directions of the United States Pharmacopœia. Both of these substances were found to fulfil all requirements, and were used in making all samples, unless otherwise specified. Distilled water was always employed. It was found, in making the samples by cold digestion, that the best results could be obtained by placing the acetate of lead in a bottle with 700 c.c. of water, dissolving by agitation, adding to this solution the oxide of lead, and agitating the mixture until the bright color, which the oxide at first displayed in the solution, had faded to a light yellow, a change usually effected in five minutes. Sufficient water was then added to bring the weight up to 1,000 gm., and the bottle was then placed on its side, in order to present a larger surface of the oxide to the solvent action of the acetate solution, and allowed to stand for the allotted time. If the precaution to agitate, after the addition of the oxide, was not taken, a cake of that substance formed on the bottom of the bottle and was difficult to dislodge; but after the color of the oxide had faded, no such cake formed.

The official method of estimation, which involves the use of normal sulphuric acid volumetric solution with methyl orange as an indicator, was first tried and afterwards adopted with a modification. The method of the revision of 1880, using normal oxalic acid volumetric solution, was also tried on a few samples; but, on account of the slow settling of the precipitate of lead oxalate, it was abandoned.

All of the solutions used in the estimations were freshly prepared according to official directions. The same proportion of the solution of lead subacetate and of the methyl orange solution was used for each titration, but the indicator was not found to give satisfactory results; for after a reddish coloration appeared in the mixture under examination, from 1 c.c. to 2 c.c. of the volumetric solution could be added before the precipitation of the lead ceased to be

visible. The methyl orange was added, however, to each subsequent sample titrated simply to approximately indicate the end of the reaction, which was determined by allowing the precipitated lead sulphate to settle and adding the volumetric solution drop by drop, until a turbidity was no longer produced in the supernatant liquid. Duplicate titrations were made with each sample and the average taken to calculate the percentage of lead subacetate. The samples made with the British proportions showed the following results:

	Per Cent.
Samples 1, 2 and 3, cold digestion for one day	29·0, 29·7, 29·7
Sample 4, cold digestion for one day (common lead acetate)	25·5
Sample 5, cold digestion for two days	22·9
Samples 6 and 7, cold digestion for one week	29·4, 30·4
Sample 8, cold digestion for two and one-half weeks	30·7
Samples 9 and 10, half-hour's boiling	31·1, 30·1

It will be noticed that, according to the table, sample 5 was weaker than sample 4, which was made in a shorter time. This seeming irregularity came about through the sample having been contained in a bottle having a defective cork for two weeks before it was titrated; thus it had been permitted to absorb carbon dioxide from the air and become thereby deteriorated.

To determine the rapidity of this change, experiments were made on sample 9, which, when freshly prepared, showed 31·1 per cent. of lead subacetate; upon standing for one week uncorked, the sample was found to contain 30·1 per cent., and, after another week's exposure, but 29·6 per cent. was present. The precipitate which formed during the exposure, proved to be a carbonate of lead.

With the proportions of the United States Pharmacopœia the following results were obtained by cold digestion.

	Per Cent.
Samples 11 and 12, one day	17·0, 17·6
Sample 13, one day (common acetate)	18·3
Sample 14, two days	18·3
Sample 15, two days (5 per cent. glycerin)	18·2
Sample 16, one week	18·4
Sample 17, two weeks	19·8
Samples 18 and 19, by half-hour's boiling	22·9, 20·5

The results yielded by samples 18 and 19 seem to indicate an improbability of attaining the official standard of 25 per cent. when following the official directions, and the other results show the chances

of reaching that strength by cold digestion of the materials in the official proportions are still less.

With the British proportions, however, we find that cold digestion for one day yields us a preparation stronger than our Pharmacopœia requires. It is, therefore, apparent that, by employing proper proportions, a solution of official strength may be had by one day of cold digestion. And this was proven by using 250 gm. of lead acetate, 147 gm. of lead oxide, and enough water to make 1,000 gm. by the directions already given in this paper. After two days the mixture was filtered and the filtrate found to contain 26·9 per cent. of lead subacetate.

While working on this subject the author decided to examine the strength of the preparation as dispensed by some retail and wholesale druggists. Four samples, obtained from retail druggists and made by them, showed respectively, 22 0, 15·7, 1·2 and 18·3 per cent., and three lots from wholesale dealers contained 25·0, 15·9 and 21·5 per cent. against the official requirement of 25 per cent.

AN INSTRUCTIVE FLORAL MONSTROSITY.

BY EDSON S. BASTIN.

A member of my class recently placed in my hands a rose which has a peculiar interest. Its sepals, instead of being united at their base into a tube, were all distinct and inserted on the thalamus. They were also longer, as long as they would be if, in an ordinary rose, the whole tubular portion had separated into five parts to its base. They were also somewhat more foliaceous than in the ordinary form of the flower. The petals were of the usual shape and numerous, the stamens and pistils also numerous, as in the ordinary form of the cultivated plant; but what was peculiar was the fact that all these parts were inserted, not on a hollow or tubular receptacle, as in the ordinary flower, but on a convex one.

The monstrosity is probably to be regarded as a case of atavism, and is instructive, not only as pointing to the conclusion that the remote ancestors of the rose had all the floral organs distinct and inserted on a convex receptacle, but also as demonstrating the nature of the lower or tubular portion of the flower. It tends to confirm the usual view held by American botanists that the exterior portion of this organ is adnate calyx, and the inner or lining portion, which bears on its surface the pistils, and on its margin the stamens and petals, is the thalamus or receptacle.

TO WHAT EXTENT IS A PHARMACIST JUSTIFIED IN PRESCRIBING?[1]

By D. J. Thomas.

The pharmacy and medical laws would seemingly clearly answer this question. These legislative acts define the privileges of both pharmacist and physician, and draw the line of demarcation that separates the two professions. They fix the boundaries of jurisdiction, and although these acts are not drawn to suit everyone, they are based upon justice and good common sense. The functions of the pharmacist are to compound and dispense physicians' prescriptions, and when he steps outside the realm of his vocation, he transgresses the law regulating the practice of medicine. The medical law clearly defines the privileges of the physician, and in no part of the act does it extend to pharmacists the right to prescribe. It is an unwritten law, however, that under certain conditions pharmacists may exercise the functions of a physician very much as the wise old grandmother exercises this function when she says that "catnip tea is good for babies." In cases of emergency—pending the arrival of a physician—a pharmacist may, from purely humane or philanthropic motives, prescribe and administer to the wants of a sufferer, and his rights in this instance may never be questioned. He sinks his identity and occupies the position of the good Samaritan.

Why does not the pharmacist possess the right to prescribe? Simply because his knowledge of the physiological action of drugs is meagre and his knowledge to diagnose disease is equally limited. His study and research is not along the same lines as that of the physician. He knows little or nothing of human anatomy, and very little more concerning the action of medicines upon the human system. He knows that acids sear and mucilaginous and oleaginous drugs mollify; but the mysteries of diagnosis place a barrier between him and the intelligent exhibition of the remedies he compounds with so much care, perfection and accuracy. No pharmacist would trust his ability to such degree that he would exercise the functions of a physician to undertake the treatment of his own child afflicted with scarlet fever or any other serious disease. Why, therefore,

[1] Read at the meeting of the Pennsylvania Pharmaceutical Association, June 18, 1896.

should he usurp the right to play the role of physicians in cases other than his own flesh and blood? Is it because he has a lower estimate of a human life not bound to him by the ties of relationship? The query is broad, inasmuch as it covers the moral and legal phases of the function of the pharmacist. As pharmacists, we should accord to physicians, without regard to its legal bearing, the privileges embodied in the Medical Act, and this carries with it nearly if not all the weight of the argument, viz.: that pharmacists, *as such*, have no legal right and no qualification to prescribe, excepting, as previously stated, in such cases of emergency as demand immediate attention, and only pending the arrival of a physician; and in no event should he undertake the treatment of diseases, specific or otherwise, because he is neither fitted by education nor by moral or legal right to play the role of physician.

There is a growing tendency on the part of pharmacists to recognize the rights of physicians; especially is this true since the enactment of the medical law. The pharmacists cannot be accused of wilfully trespassing upon the field of medicine prior to the passage of this act. They might be excused on the grounds that their jurisdiction was not clearly understood; but now the law clearly defines the offices of both pharmacist and physician.

It has been said, much to the discredit of the pharmacist, that he boldly and wilfully exercises the function of a physician and defiantly disregards all ethical and legal laws that govern the two professions. However true this may be, it does not merit the condemnation of the medical fraternity upon all pharmacists. No more should we, as pharmacists, condemn the entire medical profession for certain apparent irregularities committed by them, and who bring discredit and disgrace to their ranks. As pharmacists, we should condemn and severely discountenance all transgressions of medical law by members of our profession. It has been intimated, but not fully authenticated, that in some instances pharmacists transgress the medical law to such an extent that they make gynæcological examinations, treat obstinate diseases of the eye, ear, nose, throat, urethra, and a score of other serious diseases that demand the attention of skilled physicians. These, however, are isolated cases, and very properly should have our condemnation.

In justice to the physician, and for the promoting of a more harmonious feeling between pharmacist and physician, the former

should confine his attention to his own field of labor and not indulge in excursions into the field of the latter. The successful shoemaker sticks to his last, and it naturally follows that the pharmacist should stick to his pestle and mortar. Much of the criticism heaped upon the entire pharmaceutical profession is due to the reckless disregard of the rights of physicians by a few selfish and mercenary pharmacists. We cannot too strongly condemn this self-sufficiency, and, as members of the Pennsylvania Pharmaceutical Association, let us record our condemnation of such practice.

By closely observing the rights accorded to the physician under the act regulating the practice of medicine, much of the bitter feeling now existing between pharmacists and physicians will be dissipated and ultimately become a matter of history, and result in a warmer and more harmonious feeling between the two professions. Much criticism is placed upon physicians for their action in the matter of dispensing their own medicines. They defend their action by claiming that they have been forced into it by a custom established by the homœpathists, who universally dispense their own medicines. Some physicians claim they have been obliged to do so by the pharmacist who "counter-prescribes." This is one of the parasitic evils that cling to our profession.

Let us meet the physician more than half way, and, by denouncing all transgressions of the latter's rights, we will eventually establish ourselves in the admiration of the medical fraternity, and give to pharmacy a higher position in their estimation.

THE SALE OF ALCOHOLIC LIQUORS UNDER THE HIGH LICENSE LAW IN PENNSYLVANIA.[1]

By J. A. Miller.

One of the effects of the passage of the high license law was to stop, very largely, the dispensing of alcoholic liquors in small quantities, in the drug stores throughout the State. It was always a great convenience for families that did not care to keep a supply of liquor in the house, to get what they wanted from time to time from the

[1] Read at the meeting of the Pennsylvania Pharmaceutical Association, June 18, 1896, in answer to query No. 4, as follows: "The high license law forbids the sale of alcoholic liquors, except upon a physician's prescription. Is the law a wise one, and is it generally lived up to?"

neighboring drug store. These purchases were mostly made for medicinal, culinary or other legitimate uses. Often, however, this was not the case. Liquor was sold in many drug stores, indiscriminately, to all who asked for it, and without regard to the purpose for which it was wanted. But the high license law put a stop to this business. Alcoholic stimulants are not now so readily purchased, and the people are put to considerable inconvenience to get them.

The law took away a profitable part of the trade of the druggist, and any law, in these days, when profits are so small, that diminishes the volume of trade by taking away the most profitable portion of it, can hardly be regarded by the dealer as a just one. On the other hand, such evil consequences follow the use of alcoholic liquors that this law, which largely restricts their sale, should be regarded as a very acceptable one. Even when care was exercised in their sale it was not easy always to tell the purpose for which the stimulants were wanted. It was hard to turn away a good customer, and in doing so great offence was sometimes given. The refusal to sell on one occasion, in the writer's experience, a bottle of whiskey to a customer, occasioned the loss of his entire trade.

Several years ago, and since the passage of the high license law, we spent a Sunday in one of the western towns of this State, where there were no licensed saloons. From the train that brought us to this place on Saturday evening were unloaded a number of kegs of beer. We were told that this was a daily occurrence; that beer and other alcoholic drinks were brought in and distributed among the club-rooms and other places; and that the seven drug stores in the town were doing a large business in the sale of these stimulants by filling physician's prescriptions.

There was probably no violation of the law here. The state of affairs can be readily understood. The druggists were the only dealers in spirituous liquors, and were reaping a profit from the sale of articles for which there was a constant demand.

The demand for alcoholic liquors is everywhere. Every one of us has been besought to sell them in violation of the State law, and the charge of committing this offence has been frequently spoken against us. So far as we are concerned, we have carefully observed the law. Others whom we know have done the same. We have written a number of letters to members of this Association residing in different sections of the State upon this subject, and have received

one uniform reply to them all—that everywhere they are complying with the terms of the law.

Two cases of violation of the high license law that have come to our knowledge were in the town of Butler. One druggist, an old offender, who was arrested about a year ago, plead guilty and was sent to jail for eight months, and required to pay a fine of $2,500. The other one was a dentist, who purchased a store about two years ago. He was not registered, and was without any practical knowledge of the business. The store was run by a registered pharmacist. He was tried last fall for violation of the high license law, found guilty, sentenced to jail for seven months, and required to pay a fine of $1,500. This case has been appealed to the Superior Court on the ground that the owner was not responsible for violations of the law by his clerk.

The result of the inquiries we have made confirms the belief, so frequently expressed in the meetings of this Association, that the high license law is observed by all its members, and that alcoholic liquors are only sold on the prescriptions of physicians. Those who violate the law are mostly ignorant and disreputable persons, who have no qualifications for the business, and who are willing to earn a living by the sale of such articles as minister to the baser appetites and desires of their customers.

THE POPPY AND OPIUM IN PERSIA.[1]

By Alexander McDonald.

I have the honor to transmit herewith a report upon the cultivation of the poppy and the preparation of opium in Persia. This report has been prepared to meet some inquiries from the Southern States, and is submitted with a view to its publication in Consular Reports, so that the information contained therein may be at the service of those who are interested in the cultivation of the poppy, and in the preparation of opium for medicinal purposes.

Opium is largely cultivated in Persia. About 6,000 chests, weighing each about 130 pounds, are exported annually, and it is probable that nearly, if not quite, an equal quantity is consumed in the country.

---

[1] Consular Reports, Vol. 51, 83.

The opium poppy (*Papaver somniferum*) is by no means difficult to cultivate; but to bring it to a state of maturity to produce opium requires very considerable knowledge and unremitting care and attention. Indeed, it seems almost impossible without a thorough knowledge of the state of the plant at its various stages, and an unmistakable forecast of the weather, especially toward the time when the juice has to be collected, to even partially succeed.

All Persian opium is cultivated on irrigated land; consequently, the moisture is practically under the farmer's control. This is most important, as rain, when the plant is nearly at maturity, would be certain to destroy the opium elements. The quantity of moisture has to be most carefully regulated, except in the winter, when the plant is in a kind of quiescent state and independent of external influences.

The great difficulty which meets the amateur grower is to know the exact time when the plant arrives at maturity; for without this knowledge all his efforts will be frustrated and his outlay dissipated. All the plants on a plot will not mature at the same time, but each one has to be examined separately. If the incision for extracting the opium is made too early in the plant, nothing but a white sap will exude, and if too late, the juice will have dried up.

The following instructions, except when interfered with by climatic influences, should be carefully observed:

(1) Land intended for the opium crop should be plowed up in July, in order to free it as much as possible from weeds before sowing the seed.

(2) On irrigated lands (which are the best adapted for this crop), the whole surface must be laid out in terraces, larger or smaller as the land is flat or hilly, and each one must be surrounded by a small bank, say 6 inches high, so as to preserve a smooth and level surface, in order that the water may be turned on to an even depth. I have great doubts whether rain-watered land could be depended upon for the regular supply of moisture.

(3) The seed is sown broadcast, in September and October, on a level surface, and not on ridges. Previous to the sowing, the ground is cleared of stones and rubbish, as the plant can be easily obstructed in its growth.

(4) When the seed is sown the water is turned on, and the ground is allowed to remain without any further operation for two or three

days, until the water has become absorbed and the outer surface has had time to dry a little. The ground is then raked over, so as to make a complete covering for the seed. If there should be no rainfall within a fortnight, the water is again turned on, and this is repeated at irregular intervals until the winter rains render it unnecessary. After the sowing and before the next watering, most cultivators sprinkle manure all over the terraces. Almost any kind impregnated with strong alkalis will do.

(5) In about six weeks from the time of sowing, the plants will have shot forth four or five leaves. It may, however, be two months, for the weather is occasionally cool, and this retards growth. They should then be thinned out, so as to stand about 6 inches apart in all directions.

(6) The plants are hardy and will stand the cold up to freezing point. During the winter no irrigation is needed; but here, from the end of March, the plants will have become vigorous and should have water, either by rain or irrigation at the least, every ten days, or, if the weather is hot, every six or seven days. Again, about this time or a little later, manure is spread between the plants in order to keep them strong and stimulate the sap. It is, of course, necessary when the spring growth begins, to observe carefully the state of the plant and not give it too much water, or it will grow out of all proportion, and be utterly useless. The flowers will appear in May, and will continue for about a fortnight. After the flowers begin to droop, and until the opium matures, is the most critical time, and a close observation of the plant has to be made so that a healthy condition may be maintained. A slight watering may be necessary, but the state of the plant must be the determining factor. For some few days before the plant matures no water should be given, and, if possible, not allowed.

(7) When the flower has fallen, the boll immediately below must be very carefully noted. When it assumes a light brown color, darker than amber, it may be assumed that the poppy has matured. An incision, diagonally across the boll from top to bottom, should be made, and if the juice, of a dark brown color, exudes, it is certain that the opium is matured. The incision should be made in the evening, and the opium which adheres to the stem of the plant should be removed before sunrise in the morning. In this country the opium is collected into jars or ordinary cooking utensils, and

stored up at the cultivator's house until the harvest is finished. It must be carefully borne in mind that each plant must be examined before the incision is made, for, as stated above, there is a difference in time in the maturing of the plants—some earlier and some later. The plant ripens—if that expression may be permitted—about the end of May or beginning of June; but the time depends upon a variety of circumstances, although the variations are not great.

(8) The approximate number of plants per acre may be estimated from the distances they are apart, as given above. The Persians have no surface measurement equal to our acre, and seasons and crops vary so much that the average yield cannot be easily estimated. In view of the heavy dues and taxes paid by the cultivators of the poppy, the risk they have to run from climatic considerations, and the fluctuations in the price of opium in the foreign markets, the profits are not much greater than from the ordinary cereals.

(9) The preparation of the drug for the market is usually undertaken by the merchant, and but rarely by the cultivators. This is a business quite distinct, and requires a building and utensils generally beyond the reach of the producer. When the opium reaches the merchant it contains a good deal of foreign matter, especially pieces of the stem of the plant, to which the opium adheres. These have to be removed, and then the opium undergoes a process of kneading and pressing, so as to get rid of the superfluous water. A little linseed oil is used in the process, and some kinds are largely diluted with it. The process of preparing for the consumer requires special knowledge, which is not communicated to everyone, and the value in China largely depends on its manipulation.

It would appear that if the cultivation of opium were taken in hand seriously, two skilled persons—one, the cultivator, and the other, a kneader—should be engaged to undertake the growing and the preparation for the market. Without these, I am afraid, the enterprise would be a failure.

The climatic conditions of the Gulf States, I should say, would be favorable.

Barium has been found in hydrobromic acid to a dangerous extent by R. C. Cowley (*Phar. Jour.*, May 16, 1896). When precipitated as sulphate, the quantity present was found to correspond to 4·598 grains of barium in the pint. This impurity may account for the insoluble white precipitates that are obtained when hydrobromic acid is added to quinine sulphate.

IDENTIFICATION AND SEPARATION OF THE PRINCIPAL ACIDS CONTAINED IN PLANTS.[1]

BY L. LINDOT.

The reactions which enable us to distinguish the vegetable acids are not numerous and often uncertain in their application; and if we can characterize tartaric acid—thanks to the insolubility of its potassium salt in the mixture of alcohol and ether—we are more embarrassed if it is requisite to isolate the other acids, and especially the citric and malic, so frequently present in vegetable tissues.

When studying the compounds of these acids with quinine and cinchonine, I have found that the resulting salts, and especially the acid salts, present differences of solubility in methylic alcohol, such that it is easy to distinguish citric and malic acids and to separate them from vegetable juices.

(1) Cold methylic alcohol, at 95° Gay-Lussac, dissolves only 0·3 per cent. of acid quinine citrate; so that if we add quinine to a methylic solution of citric acid, at 2 or 2·5 per cent., this alkaloid is dissolved at first, giving then rise, on stirring, to a bulky crystalline precipitate of acid citrate, which may extend to 9·3 per cent. of the theoretical quantity. An excess of quinine, with reference to the composition of the acid salt, redissolves the precipitate and then ultimately the neutral citrate crystallizes; its solubility is greater than that of the acid citrate, and rises to 3·3 per cent.

Under identical conditions the acid quinine malate (solubility in cold methylic alcohol at 95° Gay-Lussac, 8·2 per cent.) and the neutral malate (solubility 8·0 per cent.) remain in solution. The presence of malic acid slightly interferes with the precipitation of acid quinine citrate, and when in a mixture of the two acids the quantity of malic acid represents 25, 50, 100 or 200 per cent. of the quantity of citric acid, the weight of the acid quinine citrate obtained is not more than 99, 97, 94 or 89 per cent. of the citrate which would be obtained in a liquid free from malic acid.

Under the same conditions the acid quinine oxalate (solubility 9·2 per cent.) and the neutral oxalate (solubility 8·2 per cent.) remain equally in solution; but the oxalic acid increases the solubility of quinine citrate in larger proportions than does malic acid.

[1] *Chemical News*, June 26, 1896, from *Comptes Rendus*, 122, 1185.

The precipitate of quinine citrate may be confounded with the quinine acid tartrate (solubility 2·4 per cent.) and the acid succinate (solubility 1·2 per cent.).

(2) Cinchonine dissolved in methylic alcohol precipitates malic acid under conditions identical to those in which quinine precipitates citric acid. However, the solubility of acid cinchonine oxalate in methylic alcohol, at 95° Gay-Lussac and in the cold, which is 2·5 per cent., is higher than that of quinine citrate; but the other salts of cinchonine are so soluble that the precipitation above mentioned may be considered as characteristic of malic acid. Acid cinchonine tartrate is, in fact, soluble at 20·6 per cent.; the acid citrate, the acid oxalate and the acid succinate do not crystallize until their solutions have been brought to the state of syrup. The tartaric, citric, oxalic and succinic acids, if mixed with malic acid, increase in a striking manner the solubility of cinchonine malate in methylic alcohol; it is thus that citric acid, added to malic acid in the proportions of 20, 50, 100 per cent., hinders the tenth, the half and even the whole of the oxalic acid from crystallizing as a cinchonine salt.

(3) To apply the foregoing reactions to the extraction of the acids of a vegetable juice, it must first be evaporated in vacuum and redissolved in methylic alcohol as concentrated as possible. If the juice contains potassium bitartrate and free tartaric acid, it must be treated with alcohol and ether to separate the tartar, and precipitate the tartaric acid in the state of bitartrate by a limited addition of potassa to the same ethero-alcoholic liquor. To eliminate the excess of potassa, we precipitate all the acids by basic lead acetate, and liberate them again with hydrogen sulphide. It is proper to operate in the same manner if the juices contain an excessive quantity of sugars or foreign matters.

The concentrated acids being dissolved in methylic alcohol, we take a known volume of the liquid, which we dilute with methylic alcohol, so that the solution may contain 2·5 per cent. of acid, and we add to the liquid increasing quantities of quinine in powder, until, after being stirred for some time, it sets into a crystalline mass. The quantity of quinine added should not exceed 160 to 170 parts to 100 parts of the citric acid supposed to be present. We must, in fact, avoid adding an excess of quinine, which would dissolve—momentarily at least—the acid citrate and form neutral citrate,

which is more soluble. When the proportion of quinine which must be added has thus been determined, we treat the residue of the liquid with the calculated quantity of quinine. After settling for twenty-four hours, we filter and recommence the same operation upon the mother liquor.

If the liquid does not precipitate under these conditions—that is to say, if it contains no citric acid—we search for malic acid, by adding in one part of the methylic liquid, as concentrated as possible, increasing quantities of cinchonine, the maximum dose of which may be fixed at 140 to 150 per cent. of the estimated quantity of malic acid.

If the two acids are simultaneously present, when the liquid is no longer precipitated by quinine we add cinchonine, the action of which is not interfered with by the excess of quinine.

It is easy to recover the corresponding acids from the salts of quinine and cinchonine obtained. It is sufficient to add to the aqueous solution of these salts ammonia, to filter off the alkaloids, to precipitate the liquid with basic lead acetate, and then decompose the precipitate with hydrogen sulphide; or we may render both the acid and the base insoluble by means of baryta, exhaust the dried precipitate with alcohol, and decompose the barium salt with sulphuric acid.

By these methods I have been able to extract the citric acid contained in lemons and gooseberries, and extract the malic acid contained in cherries.

RUMEX NEPALENSIS, WALL.[1]

By O. Hesse.

In Madras and other parts of India grows abundantly a species of rumex, Rumex nepalensis, Wall., which, on account of its astringent properties, is well known to the natives, who likewise apply it in medicine and for dyeing.

Mr. D. Hooper, quinologist to the Government of Madras, examined the root of this plant, and was of the opinion that it contained chrysophanic acid. But when Hesse pointed out that this substance differed from the chrysophanic acid of Parmelia parietina, Hooper wished his investigation repeated by Hesse, and sent him

[1] *Liebig's Annalen der Chemie*, 291, 305, and *Pharmaceutical Journal*, (4) 2, 441.

for this purpose a quantity of the root. The results of this investigation were to the effect that this root contained no chrysophanic acid, but a substance similar to it, for which Hesse proposed the name *rumicin*, with reference to its origin, and the names *nepalin* and *nepodin* for two other bodies which accompanied it. Of these bodies, nepalin was found to be the principal constituent of the root in question, the others occurring only in small quantities.

For the isolation of these principles the powdered root was extracted with ether by means of a reflux condenser. From the resulting solution separated yellow-brown crummy crystalline masses. These were collected and the filtrate reduced to about half its original volume by distillation, whereupon more crystalline masses were deposited, and were added to those first obtained.

The remaining solution, on slowly evaporating, yielded another crystallization, which, after washing with a little alcohol, was united with the other crystals. These were then treated with an aqueous solution of potassium carbonate, the solution filtered with as little access of air as possible to the filtrate, an excess of hydrochloric acid added, and subsequently shaken with ether. After distillation of the ether extract, nepodin remained mixed with an amorphous substance. That portion undissolved by potassium carbonate was boiled with acetone, which treatment dissolved out the rumicin from the nepalin, which was the chief constituent of the remaining residue.

Rumicin.—From the acetone solution there separated, on cooling, greenish brown crystals. These were separated from the mother liquor, washed with a little acetone, and, when completely dry, dissolved in hot benzene. Three or four times its volume of petroleum ether was added to this solution, the mixture boiled a short time and filtered, whereby a brown, flocculent body was removed. After cooling the filtrate beautiful crystals separated, which, on recrystallization from benzene and petroleum ether, were obtained perfectly pure. Rumicin was found to have the same composition as chrysophanic acid, namely the formula $C_{15}H_{10}O_4$.

	Calculated.	Found.
Carbon	70·86	70·83
Hydrogen	3·94	4·06

It formed laminar crystals of a metallic lustre, which appeared not quite so intense a golden-yellow as chrysophanic acid, and dis-

solved readily in hot alcohol, acetone or glacial acetic acid, readily also in chloroform, but scarcely at all in petroleum ether. The melting point was from 186° to 188°.

To potassium hydrate solution it imparted a purple-red color, which, on exposure to the air, gradually faded. To an aqueous solution of potassium carbonate it gave a very light rose color. Heated with alcoholic potash solution, magnificent purple-colored prisms were deposited, which, on exposure, quickly became yellow. On heating with hydriodic acid, no alkyl iodide was developed, but on the other hand a body perfectly identical with chrysophanhydanthron produced from chrysophanic acid under the same condition.

The only essential difference, therefore, between rumicin and chrysophanic acid was that of their melting points. The hypothesis of their being physical isomers was not confirmed after numerous experiments to convert these bodies one into the other.

Nepalin.—The crude nepalin, obtained as previously described, dissolved by gently boiling with benzene. To this solution three or four times its volume of petroleum ether was added and the liquid boiled a short time. A dark brown flocculent body separated, which was easily removed by filtration. From the filtrate was obtained a copious crystallization of nepalin, which was further purified by recrystallization from boiling glacial acetic acid.

This substance formed orange-colored microscopic needles, which melted at 136° to a red liquid. It was not volatile, but at a high temperature was completely decomposed. It contained no water of crystallization, and at 100° showed no loss. Its composition corresponded to the formula $C_{17}H_{14}O_4$.

	Calculated.	Found.
Carbon	72·34	72·11
Hydrogen	4·96	5·01

It dissolved readily in hot glacial acetic acid, readily also in benzene and chloroform, well in alcohol, acetone and ether, colored petroleum ether yellow, but was only very slightly affected by this solvent; with potassium hydrate it gave a purple-colored solution, which, on exposure to the air, was nearly completely decolorized by absorption of CO_2, whereby nepalin separated as a yellow crystalline precipitate. In an aqueous solution of potassium or sodium carbonate it was nearly insoluble, very slightly soluble in ammonia, to which it gave a red color, and on the addition of barium chloride

and lead acetate to the solution, a dirty-colored, flocculent precipitate was formed. Concentrated sulphuric acid dissolved it with a red color, and on adding some water to the solution, nepalin separated unaltered in yellow flocks. No alkyl iodide was developed on heating it with hydriodic acid, according to Zeisel's method, but it changed to a brown resin, which decomposed on exposure to the air.

Diacetylnepalin.—By treatment with acetic anhydride, nepalin exchanged hydrogen for acetyl. The acetic anhydride and nepalin were heated together in a closed tube at a temperature of 140°–150°, and, in order to complete the reaction, maintained at this temperature for one hour. The solution was poured from the tube while yet warm, whereupon the acetyl derivative immediately crystallized, and, after separation from the mother liquor, was recrystallized successively from hot alcohol and gently boiling glacial acetic acid. This substance formed brownish-yellow, brilliant crystals, which melted at 181° to a black liquid.

	Calculated for $C_{17}H_{12}(C_2H_3O)_2O_4$.	Found. I.	Found. II.
Carbon	68·85	68·73	68.82
Hydrogen	4·92	5·10	5·30

Nepodin.—Nepodin was also purified with benzene and petroleum ether, as described under nepalin. The hot solution was allowed to cool whereupon the nepodin crystallized in long, greenish-yellow prisms, which were quite brittle. It melted at 158°, decomposed at a higher temperature, at 100° showed no loss and contained no water of crystallization.

Its composition indicated the formula $C_{18}H_{16}O_4$.

	Calculated.	Found.
Carbon	72·97	72·94
Hydrogen	5·41	5·79

Nepodin dissolved in alcohol, acetone, ether, chloroform and glacial acetic acid with tolerable readiness, and crystallized from these liquids in prisms. In benzene it dissolved very readily; and when to this solution was added petroleum ether or ligroin fine crystals were produced. In alcoholic solution it did not give an acid reaction. It quickly dissolved in an aqueous solution of potassium or sodium carbonate with a yellow-brown color, but which rapidly became darker. In potassium hydrate solution it also dis-

solved quickly with the same color, and in concentrated sulphuric acid with an intense yellow-red color. On the addition of some water to the latter solution, the substance separated, unaltered, in yellow flocks. When barium chloride and lead acetate were added to its ammonia solution, a grayish-yellow amorphous deposit was formed. Heated with hydriodic acid according to the method of Zeisel, it developed no alkyl iodide, but was left as a black-brown resin.

Diacetylnepodin.—When treated with a surplus of acetic anhydride for six hours at a temperature of 85°, a crystalline derivative was formed. This compound crystallized in large, tabular, pale yellow rhomboids. It contained no water of crystallization, and melted at 198°, with decomposition. Its formula was considered to be $C_{18}H_{14}(C_2H_3O)_2O_4$.

These results show that Rumex nepalensis, Wall., contains a series of substances totally different from those found in the allied group of Rheum, of which rhubarb is a member. The latter drug contains chrysophanic acid, $C_{15}H_{10}O_4$, emodin, $C_{15}H_{10}O_5$, and rheïn $C_{15}H_{10}O_6$, these substances differing in their proportion of oxygen, while the principles found in Rumex nepalensis, Wall., seem to form a homologous series, the members of which differ by CH_2. There is not sufficient proof to establish the identity of chrysophanic acid and the rumicin obtained from the other members of the Rumex group, but their uniformity of behavior, when treated with hydriodic acid, is a subject on which further enlightenment is required.

JABORANDI AND ITS ALKALOIDS.[1]

BY DR. B. H. PAUL AND A. J. COWNLEY.

Although jaborandi is defined in the British Pharmacopœia as the dried leaflets of Pilocarpus pennatifolius, it is certain that the drug met with in commerce, under the name of jaborandi, is frequently, in part, the produce of other species of Pilocarpus and, in some instances, even of plants belonging to another genus. As to the nature of the basic constituents of these different drugs, but little is known, and the discrepancies in the descriptions given of pilocarpine are very suggestive of doubt whether the alkaloid referred to

[1] *Pharm. Jour.* (4), 3, 1 (July 4, 1896).

is always the same substance. This uncertainty is very evident from the account given of pilocarpine in Husemann's "Pflanzenstoffe," as being "difficultly crystallizable," and from the statements in Watts' "Dictionary of Chemistry" and Thorpe's Dictionary that it is "crystalline;" while in other places the alkaloid is described as a syrupy liquid, very soluble in water.

The characters and tests given in the British Pharmacopœia and other pharmacopœias are not sufficiently distinctive for the identification of pilocarpine, and they furnish no proof of absence of other bases capable of forming crystallizable salts with nitric or hydrochloric acid. In the examination of several kinds of jaborandi leaves described by Mr. Holmes, in his papers on the botanical part of the subject,[1] we have endeavored to test the individuality of the basic products extracted by the melting points of the nitrate, and have in that way obtained evidence of differences which appear to point to the desirability of more minute investigation than we have yet been able to carry out, on account of the small quantity of material at our disposal. In testing samples of commercial pilocarpine nitrate obtained from Mr. Martindale, similar differences of melting point have been observed; in one instance the salt melted at 141·7° C., another sample was found to melt at 167·2° C., while a third, supplied by Mr. Gerrard, melted at 150 5° C.

A sample of the small-leaved jaborandi, described by Mr. Holmes as maranham, and named by Dr. Stapf, Pilocarpus microphyllus, yielded 0 84 per cent. of alkaloid, which was converted into nitrate, and gave 0·45 per cent. of a crystalline salt melting at 160° C. A solution containing 2 grains in the fluid ounce, when applied to the eye, produced contraction of the pupil. On recrystallization from alcohol the salt was separated into two portions, the larger portion melting at 162·7° C., while the other melted at 147·7° C.

From the leaves described by Mr. Holmes as Aracati jaborandi, Pilocarpus spicatus, we obtain only 0·16 per cent. of alkaloid. This gave two crystalline nitrates, melting respectively at 151·5° and 130·5° C., an amorphous nitrate, the base of which was soluble in water; also, an amorphous alkaloid insoluble in water, corresponding to the description of jaborine, by Harnack and Meyer. Obviously these leaves are of little value as a source of pilocarpine.

---

[1] *Pharm. Jour.* (4), **1**, 520.

The leaves of Ceara jaborandi, Pilocarpus trachylophus, yielded 0·4 per cent. of alkaloid, but only 0·02 per cent. of crystallizable nitrate.

From the leaves of Pilocarpus jaborandi we obtained 0·72 per cent. of alkaloid, yielding 0·67 per cent. crystallizable nitrate, with a melting point of 161° C.; it was separable on recrystallization into nearly equal portions, melting respectively at 162·67° and 158·3° C.

A sample of reputed jaborandi leaves was found, on examination, to contain:

Leaves of Pilocarpus jaborandi	12
Leaves of Pilocarpus trachylophus	38
Stalks	50
	100

On analysis, it yielded 0·13 per cent. of alkaloid, rather more than half of it being convertible into crystalline nitrate that was separated by recrystallization into portions melting at 157·7° and 147·7° C.

The following table gives a concise statement of our results:

	Total Alkaloid. Per Cent.	Crystallizable Nitrate. Per Cent.	Recrystallized Nitrate.	Melting Point.
Pil. spicatus	·16	—	{ ·03 ·04	151·5° 130·5°
Pil. trachylophus	·40	·02	{ — —	— —
Pil. jaborandi	·72	·67 (161° m. p.)	{ ·37 ·30	162·7° 158·3°
Pil. microphyllus	·84	·45 (160° m. p.)	{ ·23 ·22	162·7° 147·7°

From these results it is apparent that, while the several kinds of jaborandi leaves met with in commerce differ considerably in the amount of alkaloid they contain, the product obtained is probably always a mixture of two or more distinct alkaloids. The question whether the alkaloids hitherto described are natural constituents of the leaves or products of the alteration of pilocarpine, cannot at present be answered. According to Harnack[1] and Merck, jaborandi

[1] *Chem. Centralb.*, 1885, 628; *Jour. Chem. Soc.*, **1**, 85; and *Pharm. Jour.* (3), **16**, 106.

leaves yield four bases—pilocarpine, pilocarpidine, jaborine and jaboridine, the two latter being formed respectively from the two former. Hardy and Calmels,[1] on the contrary, consider that pilocarpidine is not a natural constituent of the leaves, but a product of the alteration of pilocarpine, effected in the extraction, while they question the existence of jaboridine. But the definition of all these bases is defective. The pilocarpidine of Harnack is said to form a finely crystallizable nitrate, but Hardy and Calmels state that the pilocarpidine produced by them from pilocarpine gives "basic salts that exactly resemble those of pilocarpine," but are "gummy." Additional uncertainty has been produced by inaccuracy in the published abstracts of original memoirs; thus, for instance, the abstract of Hardy and Calmels' paper in the *Journal of the Chemical Society*[2] states that nitric acid "has no action on pilocarpine," whereas, the original says that it has only the effect of converting it into pilocarpidine.[3]

In order to ascertain whether the differences of melting point observed in the nitrate obtained by recrystallization, as well as in commercial samples of the salt, were due to alteration of pilocarpine, we submitted several portions to the action of heat, which is stated to have the effect of converting pilocarpine into jaborine, and also into pilocarpidine. In operating upon the salt described as "pure pilocarpine nitrate," and melting at 141·7° C., we found that, after being heated in solution for fourteen hours in contact with air, there was a reduction of the melting point to 133°. The salt was still crystalline, and, on recrystallization from alcohol, it was separated into two portions: one, crystalline, amounting to 80 per cent. of the original quantity, melted at 138·2°, while the other was gummy, and contained a base insoluble in water. Evidently the alteration in this case was only partial.

Another portion of the same salt was recrystallized from alcohol in fractions, but without any considerable alteration in the original melting point being effected, as in the case of nitrate obtained from the samples of jaborandi leaves in the experiments above described.

In connection with the high melting point of one of the samples of commercial nitrate, for which we are indebted to the kindness of Mr. Martindale, it is of interest to mention that, when administered

---

[1] *Compt. Rend.*, **102**, 1116.
[2] *Jour. Chem. Soc.*, **50**, 900.
[3] *Compt. Rend.*, **102**, 1562.

by injection of 8 drops of a 3 per cent. solution, it produced the unusual effects of intense desire to micturate, with strangury and subsequent vomiting. According to the account furnished by Dr. Owen Lankester to Mr. Martindale, this occurred on three separate occasions, while the solution of another sample of the salt simply produced the sweating characteristic of jaborandi.

We hope to be able to follow up this inquiry, and, by operating upon larger quantities of definitely authenticated material, to obtain some better knowledge of the bases obtainable from jaborandi, as well as means of distinguishing those of which little more than their names can be learned from published accounts.

A SPURIOUS MARANHAM JABORANDI.[1]

By E. M. Holmes.

Genuine jaborandi, Pilocarpus jaborandi, has for some months past been a scarce article in commerce. The small leaves of the Maranham jaborandi, Pilocarpus microphyllus, have, however, been procurable, and have met with a ready sale to buyers for Germany, presumably for the preparation of pilocarpine, of which they contain a good percentage. Some of the more recent importations of these leaves have contained a few bales of leaves almost indistinguishable from them to the eye of a casual observer, but differing entirely in the absence of oil cells from their tissue. Some of these have already passed into commerce, and attention has probably been directed to them by their not yielding pilocarpine.

From samples sent me by Messrs. Wright, Layman and Umney, and Messrs. W. J. Bragg & Co., of Liverpool, and from fragments of flowers and fruit which Mr. J. O. Braithwaite kindly selected from a quantity of the leaves, I have been able to identify the family and genus to which the plant yielding them belongs.

For practical purposes the leaves, or, more properly, leaflets, may be recognized by the absence of oil cells, by their reticulated venation (the veinlets being usually pellucid), by not tapering to a narrow base, and by the very short hairy petiolule, about 1 mm. long. The upper surface is glossy, of a brownish-green tint, not grayish-green, as in P. microphyllus, and the midrib, on the upper surface, is minutely hairy, and the lateral veins form a more acute angle with

---

[1] *Pharm. Jour.* (4), 3, 2 (July 4, 1896).

the midrib. Usually there are small rounded or oval leaflets, about ½ cm. long, mixed with the larger leaflets, which average 2½ to 3 cm. long; these are never present in the true Maranham jaborandi. The presence of these small leaflets should, therefore, at once serve to the unaided eye as a guide to the presence of the spurious drug.

So far as I have been able to ascertain, the plant yielding the leaflets is hitherto undescribed, and it may, therefore, be useful to record the details at present obtainable. The leaves (*a*) are erecto-patent, alternate with the rachis, which is covered with minute, incurved, ferruginous hairs, imparipinnate, with four or rarely five pairs of alternate leaflets, which are small and rounded in the lowest pair, becoming gradually larger towards the terminal leaf, which is largest, reaching 7 (or more) cm. long by 1½ cm. broad (*b*). The leaflets vary in shape from orbicular to ovate, elliptical or rhomboidal-lanceolate; they are emarginate, glossy and brownish-green above, with the midrib hairy, especially towards the base, paler and glabrous beneath, and are furnished with a short petiolule, 1 mm. long. The surface is minutely reticulated with pellucid veinlets. In some leaflets, however, the veinlets are opaque, partly or wholly. The centre of each areola is paler and semi-translucent. The leaves of the young shoots are comparatively thin.

The leaflets have usually all the network of the veins translucent, and the centre of the areolæ between the veinlets is paler than the margin next to them. From this appearance of the veinlets, I was at first led to suppose that the leaves belonged to some anacardiaceous plant, especially as the fruit appeared to be one-seeded. The examination of the young ovary, however, at once showed that with ten ovules it could not belong to that natural order. The translucency of the veins is, however, due to quite another cause than the secretory cells characteristic of the veins in that natural order. Prof. Greenish was kind enough to cut some sections of the leaf for me, and these showed that palisade cells were absent over the veins, and that the small cells which replace them are free from chlorophyll. The paler, semi-translucent appearance of the centre of the areolæ is apparently due to hollow spaces in the spongy parenchyma, the cells of which contain but little chlorophyll.

Only two imperfect flowers were met with (*c*), and in these the calyx was torn; only five stamens were present and a portion of a petal. It was, however, possible to determine that the calyx was

membranaceous; the ovary sessile, densely hairy, furnished with a style equalling it in length, with a capitate stigma, and containing ten oblong ovules in two rows. The halves of a hairy pericarp (*d*) found with the leaves showed that the fruit is one-celled, oblique, inflated, about 1 cm. long and 7 mm. broad, with a partially separable endocarp, attached to a slender, glabrous pedicel, 1½ cm.

SPURIOUS MARANHAM JABORANDI.

a, young twig, leaflets two-thirds natural size; *b*, terminal leaflet showing portion of reticulated venation; *c*, imperfect flower, showing ovary and style; *d*, pericarp one-half natural size; *e*, young fruit, with pedicel.

long (*e*). On showing the flowers to Mr. W. B. Hemsley, at the Kew Herbarium, he suggested that they might belong to the genus Sweetia, in Leguminosæ. On comparing the leaves of that genus I found that they did not correspond with those of the drug, nor were the fruits like the half pericarps I had. On looking through the allied genus Swartzia, however, I found that there were three spe-

cies with very similar leaves and two which had very similar pods. These are S. pilulifera, Benth.; S. mollis, Benth.; and S. Matthewsii, Benth.

S. pilulifera differs in having only two pairs of opposite leaflets, a very short, inflexed style and a stalked ovary.

S. mollis differs in its very hairy leaflets and glabrous ovary, as figured in *Ann. Sc. Nat.* (2), **20**, t. 4.

S. Matthewsii differs in its semi-lunate pod, and in the pedicel of the fruit being only two to three lines long and the ovary containing only two to three ovules.

The false Maranham jaborandi, therefore, probably belongs to an undescribed species, characterized by its leaves having four pairs of leaflets, with a terminal one; the leaflets having strongly reticulated venation, an emarginate apex, and being alternately arranged on the rachis; by the hairy ovule containing ten ovules, the slender style as long as the ovary, the capitate stigma, and the short, inflated pod, about 1 cm. long, sessile on a slender pedicel, 1½ cm. long. Until further specimens are procurable, from which it might be determined if only one petal and five stamens are present, the plant might be provisionally named Swartzia decipiens.

RECENT CONTRIBUTIONS TO PHARMACY.

A NEW REAGENT FOR ALKALOIDS.

Sodium vanadate has been suggested by Jaworowski (*Phar. Zeit. für Russland*, **35**, 326) as a reagent for alkaloids in acetic acid solution. The addition of a salt of copper to the reagent increases its delicacy. 0·3 gramme each of sodium vanadate and copper sulphate are dissolved separately in 10 c.c. of water, and, after cooling, the two solutions are mixed. Acetic acid is then dropped in until the precipitate of copper vanadate is dissolved; usually not more than 7 or 8 drops of the acid are necessary. The slightly cloudy solution is filtered, and then it is ready for use, which is as follows: the alkaloid, if existing as a salt, is dissolved in 4 or 5 c.c. of water, or, if free, a little acetic acid is used, and heat if necessary. After cooling, one drop of the reagent is added, and if no precipitate forms after fifteen minutes, the solution is divided into two portions; to one, another drop of the reagent is added; the other portion is

heated to the boiling point. A precipitate or opalescence will be obtained in one of the three cases.

The author divides the alkaloids into three groups, according to the concentration required for them to produce a precipitate.

The first group includes such alkaloids as are precipitated when existing in solution of a strength of 0·01 to 0·001 per cent. The second group require a concentration of 0·1 per cent. The third group are either not precipitated or only from concentrated solution.

In the first group are placed thebaine, berberine, nicotine, aconitine, strychnine, quinine and the other cinchonic alkaloids, brucine, emetine and apomorphine; in the second group, morphine, sparteine, papaverine, atropine, narcotine, codeine, cocaine and hyoscine; in the third group, caffeine, colchicine, coniine, cotoine, narceine, pilocarpine, piperine, solanine, theobromine and veratrine.

THE FUNCTION OF CALCIUM IN PLANTS.

The *Pharmaceutical Journal* for June 20, 1896, summarizes the recent work on this subject as follows: In 1875, J. Boehm arrived at the conclusion that one of the functions of calcium in plants is to aid in the conduction of carbohydrates. Subsequently, A. F. W. Schimper showed that oxalic acid is a by-product in the building up of proteids in plants which normally contain crystals of calcium oxalate, and that, in the absence of calcium, acid potassium oxalate accumulates in the leaves and buds and acts as a poison. He concluded, therefore, that the use of calcium is to combine with and neutralize this poisonous salt. Sugar, however, was proved to travel in leaves containing no appreciable amount of calcium, and carbohydrates were found sometimes from the seeds up the stem of the seedling, without any corresponding emigration of calcium. P. Groom (*Annals of Botany*) now suggests that acid potassium oxalate retards the action of diastase on starch, and that the first effect of the salt on the assimilating tissues is the accumulation of starch, owing to an arrest in the change of the carbohydrate into sugar. The second effect, as the soluble oxalate accumulates, is the retardation of the manufacture of starch, and hence, probably, of the assimilation of carbon; whilst the last effect is the death of the protoplasm. Groom's researches, therefore, confirm Schimper's discovery—that the evil effects of a lack of calcium are to be attributed

to the accumulation of acid potassium oxalate in plants which normally contain calcium oxalate. They may also be regarded as complementary, in showing that in the absence of calcium there is a stoppage in the conduction of those carbohydrates only which have entered into the condition of starch. Part of the carbon assimilated by plants never enters into the starch condition, and it is clear, therefore, why growth is not at once arrested in shoots or seedlings deprived of calcium.

ON THE PRESENCE IN MONOTROPA HYPOPITYS OF A GLUCOSIDE OF METHYL SALICYLATE AND OF A SOLUBLE FERMENT.

Em. Bourquelot (*Jour. de Pharm. et de Chim.*, (6) **3,** 577) has investigated the glucoside of methyl salicylate in Monotropa hypopitys, and the soluble ferment, which is capable of decomposing this glucoside. The same author has already (*Jour. de Pharm. et de Chim.*, (5), **30,** 96, 188 and 433) pointed out the presence of methyl salicylate in several species of Polygala and in Monotropa hypopitys. His observations have led him to believe that methyl salicylate does not pre-exist in the plant, but that it is formed, when the latter is crushed, by the action of a soluble ferment on a glucoside of this particular ether, and that, during the life of the plant, the ferment and the glucoside are located in different cells.

The glucoside is first separated from the plant by cutting (or breaking, in the case of Monotropa) the plant in contact with 95° alcohol, previously heated to the boiling point. The alcohol is recovered by distillation, and the syrupy residue dissolved in alcohol and treated with neutral lead acetate. The mixture is filtered, and the filtrate, which contains the glucoside, is treated with hydrogen sulphide to remove lead. After removal of lead sulphide by filtration, the solution is concentrated and precipitated with ether. The amorphous mass is the impure glucoside, which may be purified by a repetition of the process, but the compound has not yet been obtained in the crystalline state. Its aqueous solution deviates a ray of polarized light to the left. The author considers it to be a glucoside of methyl salicylate, because the odor of the latter is developed when this glucoside is heated with a 2 per cent. solution of sulphuric acid, and when this cooled liquid is agitated with ether, the ethereal solution separated and evaporated, the residue yields a violet coloration with solution of ferric chloride.

The ferment in Monotropa is extracted by rubbing the fresh plant with clean, dry sand, and at once throwing into strong alcohol. After a half-hour's standing the mixture is filtered, washed with alcohol and then with ether. The residual powder contains the ferment mixed with sand. When this powder is added to some of the solution containing the glucoside of methyl salicylate the odor of methyl salicylate is developed. A ferment also exists, as shown by the author, in at least two species of Polygala, and when this ferment is added to the glucoside from Monotropa, the odor of methyl salicylate is developed. The following plants also contain the ferment as found by the author, and in confirmation of the results of Procter[1] and Schneegans and Gerock:[2]

Gaultheria procumbens, Betula lenta, Polygala senega and Spiræa ulmaria.

GLYCEROPHOSPHORIC ACID AND GLYCEROPHOSPHATES.

Delage and Gaillard (*Nouveaux Remèdes*, 1896, p. 217) have devised a shorter method of preparing these compounds than that previously published by Portes and Prunier (AM. JOUR. PHARM., 1894, p. 383). According to the new process, 1 part of 60 per cent. phosphoric acid is mixed in a glass flask with 1½ parts of glycerin, whereby the temperature is raised from an initial temperature of 15° to 25°. The flask is then fitted with a thermometer and a tube for the escape of gases; heat is then applied so as to raise the temperature of the mixture gradually. At 120° it begins to boil and becomes pale yellow; at 160° it is dark yellow, and at 190° it is brown, has a syrupy consistence, and gives off the vapors of acrolein. In forty minutes it is possible to combine a mixture of 100 grammes of phosphoric acid and 150 grammes of glycerin. When the mixture is cooled a viscous mass is obtained. The product is treated with 30 grammes of a mixture obtained by stirring 50 grammes of calcium carbonate into 250 c.c. of water. The mixture is agitated and allowed to stand six hours, or until effervescence ceases, when it is filtered. The resulting limpid liquid is treated with half its volume of 90 per cent. alcohol, whereupon the calcium glycerophosphate is precipitated in flocks. This precipitate is collected on a filter, washed with alcohol, dissolved in water, and the glycerophos-

---

[1] AM. JOUR. PHARMACY, 1844, p. 241.

[2] *Archiv der Pharmacie*, 1894, p. 437 and AM. JOUR. PHARMACY, 1895, p. 14.

phate again precipitated with alcohol. The precipitate is collected and dried at as low a temperature as possible, over lime or sulphuric acid.

The resulting powder has an amorphous appearance, but is found under the microscope to be crystalline. The yield from the foregoing quantities was found to be 6 grammes. The portion not precipitated by alcohol yields, on evaporation, a gelatinous mass containing calcium glycerophosphate not precipitated by alcohol, but precipitated on the application of heat.

The glycerophosphates of sodium and potassium have only been obtained in solution. Those of magnesium, lithium, strontium, ferrous and ferric iron have been prepared.

The author gives the following formulas for the administration of glycerophosphates:

Calcium glycerophosphate		6 grammes.
Sodium "	each	2 "
Potassium "	each	2 "
Magnesium "	each	2 "
Ferrous "	each	2 "
Tincture of St. Ignatius' bean		30 drops.
Pepsin		3 grammes.
Diastase		1 "
Tincture of kola		10 "
Syrup of cherries		200 "

Dose, a tablespoonful.

Calcium glycerophosphate	0·30 gramme.
Magnesium "	0·10 "
Ferrous "	0·05 "
Powdered St. Ignatius' bean	0·03 "
Pepsin	0·15 "
Diastase	0·05 "

For one cachet.

Ferrous glycerophosphate	0·05 to 0·10 gramme.
Powdered rhubarb	0·05 "
Extract of cinchona	0·15 "

For one pill.

EDITORIAL.

THE ELECTROLYTIC PRODUCTION OF ALKALI AND BLEACHING POWDER.

The problem of the production of chlorine and caustic soda by the electrolysis of the alkaline chlorides has occupied the attention of many experimenters during the past ten years, and what at first looked to be a practical impossibility has now become a commercial success.

Two great difficulties had to be overcome before this success could be obtained. It is well known that when anodes and cathodes are placed opposite each other in a solution of sodium chloride, but without being separated by a porous diaphragm, the electric current gives rise to the formation of hypochlorite of sodium. If, on the other hand, you place porous diaphragms between the positive and negative plates in such a way as to form water-tight compartments, chlorine will be generated in all the positive compartments, and caustic soda in all the negative ones. Again, both the chlorine and the oxygen, as evolved, have a powerful disintegrating action on ordinary carbons; so that a form of carbon had to be sought that would be capable of resisting the action of these elements for a lengthy period. Gas carbon, specially prepared and highly heated, so as to obtain a maximum density, was finally found to work best. The difficulty with the diaphragm was a much more persistent one, and has not been entirely overcome. We have, however, at the present moment three promising industrial processes for the electrolysis of salt solution, which claim to have substantially overcome the difficulties just noted, and a brief account of these, abridged from the *Engineering and Mining Journal*, of June 13 and 20, 1896, may be of interest to our readers.

The first of these is the Richardson-Holland process, which is worked by the Electro-Chemical Company, at Parr, near Widnes, in Lancashire, England. In this process, instead of porous partitions, use is made of one non-porous partition which does not quite reach to the bottom of the tank, so that the solutions in the two compartments are not separated from each other at the bottom of the electrolyzer. In the electrolyzing tanks, the solution of soda attains a maximum density of 14 per cent., but is not wholly free from chlorine, which means that there is some loss of soda, as well as chlorine, due to formation of hypochlorite.

The plant erected promises to turn out 6,400 tons of caustic soda (of 70 per cent. strength) and 13,320 tons of bleaching powder per annum, and the entire production for the current year (1896) has been sold in advance.

The Castner process differs very materially from that just described, and seems to be in all respects superior to it. In this case the diaphragm consists simply of a layer of mercury, which constantly oscillates in a compartment closed on each side by a non-porous partition, the lower end of which just reaches the layer of mercury. No resistance is offered by this diaphragm, which automatically (in consequence of a slow rocking of the tank) leans first towards the cathode and then towards the anode, and which, in coming alternately in contact, first with one and then with the other, absorbs the sodium liberated, and then at once gives it up to the water which is over the mercury. There seems to be an entire absence of hypochlorite formation, and the solutions of caustic soda formed in the cathode compartments have a density of 20 per cent., and yield, on evaporation, solid caustic soda of 78 per cent. strength

—a product which has not, up to the present, been heard of in the alkali industry.

The installation of the English Castner-Kellner Alkali Company is to be of 4,000 horse-power, and will turn out 6,300 tons of pure caustic soda, and 13,600 tons of bleaching powder per year. In this country the Mathieson Alkali Company is erecting a plant of 2,000 horse-power at Niagara Falls, to work the Castner patents.

The third process referred to is that of Jas. Hargreaves, in which a porous diaphragm is used on either side of the positive compartment, within which the electrolyte is placed, while the negative compartments to either side are empty at first. When the current passes, chlorine is evolved in the positive compartment, while caustic soda oozes through the diaphragm to either side, and is swept off the outside of the same by a current of steam, and rapidly converted into carbonate of soda.

The experiments made at the works of the General Electrolytic Company, at Farnsworth, near Widnes, in Lancashire, show that, with 2,000 horse-power, 5,830 pounds of sodium chloride will be decomposed daily, and that the products of the electrolysis will be 26¼ tons of bleaching powder and 15 tons of sodium carbonate. The cost by this process seems to be less than that by either of the two before mentioned.

The one thing which seems abundantly demonstrated is that the manufacture of caustic alkali and bleaching powder is no longer dependent upon the time-honored Leblanc process, which seems destined to give way, in the near future, to simpler methods, which at the same time yield purer products.

S. P. S.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

YEARBOOK OF THE UNITED STATES DEPARTMENT OF AGRICULTURE, 1895. Washington: Government Printing Office, 1896. Pp. 616.

Over 500 pages of the book are devoted to original articles, most of which contain a fund of practical information, the value of which is not limited to the agriculturists for whom they were prepared. Among the thirty original papers, we especially note the following: "Soil Ferments Important in Agriculture," by H. W. Wiley; "Frosts and Freezes as Affecting Cultivated Plants," by B. T. Galloway; "Oil-Producing Seeds," by G. H. Hicks; "Some Additions to Our Vegetable Dietary," by F. V. Coville; "The Pineapple Industry in the United States," by H. J. Webber; "The Relations of Forests to Farms," by B. E. Fernow; "Inefficiency of Milk Separators in Removing Bacteria," by V. A. Moore. A number of these contributions are handsomely illustrated. The paper on oil-producing seeds is of special interest to pharmacists, because of its completeness on the sources of fixed oils and statistics concerning them.

UEBER EINIGE NEUE ABKÖMMLINGE DES TERPINEOLS. Von Henry V. Arny. Inaugural Dissertation for the Degree of Doctor in Philosophy. Göttingen. 1896.

The author reached the following conclusions as the result of his investigation:

(1) Terpineol gives, with both primary and secondary amines of the fatty and aromatic series, well-characterized nitrolamines.

(2) Terpineolnitrosochloride, by the action of zinc dust and glacial acetic acid, is reconverted into terpineol.

(3) Terpineolnitrosochloride gives, on treatment with sodium alcoholate, an oxyoxim, $C_{10}H_{15}OHNOH$.

(4) This oxyoxim is convertible, by dilute sulphuric acid, directly into carvon.

(5) Through this conversion is the near relation of terpineol to the carvon series established.

(6) The oxyoxim gives as carvoxim, with concentrated sulphuric acid, para-amidothymol.

TRANSACTIONS OF THE ACADEMY OF SCIENCE OF ST. LOUIS. Vol. VIII, No. 6. Flowers and insects. By Charles Robertson. Contributions to an account of the ecological relations of the entomophilous flora and the anthophillous insect fauna of the neighborhood of Carlinville, Ill.

UEBER EINIGE JAPANISCHE NAHRUNGSMITTEL. Von Dr. Oscar Loew. Tokyo, Japan. 1896.

In the list of Japanese foods given are a number which are well known in this country, but which have not been thought of in connection with the subject of food, viz.: Lilium auratum and L. tigrinum, Pteris aquilina, Osmunda regalis, and Equisetum arvense, all of which, no doubt, are employed for their mucilage.

SUR UNE METHODE DE SEPARATION DES METHYLAMINES PAR L'ALDEHYDE FORMIQUE. Par Stéphane Marcl Delépine. Thesis for diploma of pharmacist of the first-class. Paris: Gauthier-Villars et Fils. 1896.

ORGANISMES DES HYDROLATS ET DES SOLUTES. Par Henri Barnouvin. Thesis for diploma superior of pharmacist of the first-class. Paris. Société d'Editions Scientifiques. 1896.

This is a valuable contribution to the knowledge of the various growths which occur in many solutions, especially in those of the alkaloids.

KEIL'S MEDICAL, PHARMACEUTICAL AND DENTAL REGISTER-DIRECTORY AND INTELLIGENCER. Fourth edition. George Keil, editor. Philadelphia: Burk & McFetridge. 1896.

The fourth edition of Keil's Directory contains a list of the physicians, dentists and pharmacists in the States of Pennsylvania, New York, New Jersey, Maryland, Delaware and the District of Columbia. There is also much useful information concerning colleges, hospitals, dispensaries, societies, laws, etc.

LASHER'S DIRECTORY OF THE WHOLESALE GROCERS AND CANNERS AND PACKERS OF THE UNITED STATES AND CANADA. Fourth edition. Philadelphia: George F. Lasher. 1896.

FLORA OF WEST VIRGINIA. By Charles Frederick Millspaugh and Lawrence William Nuttall. Field Columbian Museum. Publication 9, Botanical Series. Vol. I, No. 2. Chicago. 1896. Illustrated.

On Sundry Collections of Mammals. By D. G. Elliot. Field Columbian Museum. Publication 11, Zoological Series. Vol. I, No. 3. Chicago, May, 1896. Illustrated.

The Principal Diseases of Citrous Fruits in Florida. By Walter T. Swingle and Herbert J. Webber. U. S. Department of Agriculture. Bulletin No. 8. Washington. 1896. Illustrated.

The *St. Louis Chronicle's* Photographic Views of the Great Cyclone at St. Louis. May 27, 1896. From Meyer Brothers' Druggist.

Massachusetts College of Pharmacy. Thirtieth Annual Catalogue. 1896-97. Boston, Mass.

Catalogue of the University of Pennsylvania, Faciculus of the Department of Medicine. 1896-97. Philadelphia, Pa.

Northwestern School of Pharmacy. Circular of Information for 1896-97. Chicago, Ill.

Annual Announcement of the Ontario College of Pharmacy. Seventeenth session. 1896-97. Toronto, Ont.

Albany College of Pharmacy. Annual Catalogue, 1896-97. Albany, N. Y.

PHARMACEUTICAL ASSOCIATIONS.

AMERICAN PHARMACEUTICAL ASSOCIATION.

The forty-fourth annual meeting will be held at Montreal, Canada, beginning Wednesday, August 12, 1896, at 2.30 o'clock P.M. The first session of the Council will be held on the same date, at 10 o'clock A.M.

Credentials of delegates should reach the permanent secretary at his office not later than August 4th ; after that date they should be sent in care of the local secretary.

Propositions for membership may be sent to the secretary of the committee, Geo. W. Kennedy, Pottsville, Pa., up to August 7th, after which date they should be sent to him at the Windsor Hotel, Montreal.

Essays and papers to be read at the meeting should be forwarded without delay to the chairmen of the respective sections, viz.: Education and Legislation, Prof. C. S. N. Hallberg, Chicago, Ill.; Scientific Papers, Prof. S. P. Sadtler, Philadelphia, Pa.; Commercial Interests, Geo. J. Seabury, Esq., New York, N. Y. Papers received after July 20th cannot be printed in time for the meeting.

The Committee of Arrangements have issued a circular of information, a copy of which has been mailed to every member. Headquarters of the Association will be at the Windsor Hotel. Quarters may be secured in advance by addressing the local secretary, Joseph E. Morrison, 43 Church Street, Montreal, Canada ; in order to avoid a rush and a confusion, early application should be made for same.

The Chairman of the Committee on Transportation has furnished the following information, which will, no doubt, be supplemented by individual circulars for the different sections: All the railroads of the Trunk Line, Central, Western and Southern Passenger Associations, have agreed to furnish a rate of 1⅓ fare on the certificate plan. In purchasing a ticket, a certificate, properly signed by the agent, must be secured, upon presentation of which to the ticket agent at Montreal, after countersignature by the permanent secretary, a return ticket will be issued at one-third fare. Tickets to Montreal must be purchased between August 9th and 15th, and return tickets within three days after final adjournment of the meeting.

The New England delegation will leave Boston on Monday, August 10th, at 9.40 A.M., by Boston and Maine Railroad, reaching the Crawford House at 3.20 P.M. Here the party will remain until Tuesday, at 12.35 P.M., thus giving an opportunity of enjoying White Mountain scenery. Arrive in Montreal at 8.30 P.M.

The New York, Pennsylvania and Southeastern delegations will leave New York by the Delaware and Hudson River Railroad, on Tuesday morning, August 11th, passing through the Adirondacks and reaching Montreal the same evening.

The Western delegations will meet at Chicago and leave there by the Wabash Railroad, on Sunday afternoon, August 9th, for Toronto, Canada, where one of the Richelieu and Ontario Navigation Company's steamers will be taken, and the rest of the trip made by boat to Montreal, arriving about 8 P.M. on Tuesday.

Special information, if desired, may be obtained from the members of the committee: Joseph E. Morrison, Montreal, Canada, chairman; Albert E. Ebert, Chicago, Ill.; Sam'l A. D. Sheppard, Boston, Mass.; Chas. M. Ford, Denver, Col.; Harry Sharp, Atlanta, Ga.; Wm. J. M. Gordon, Cincinnati, O.; Henry M. Whelpley, St. Louis, Mo.; C. A. Mayo, New York, N. Y.; Louis F. Chalin, New Orleans, La.; Wm. M. Searby, San Francisco, Cal.; Karl Simmon, St. Paul, Minn.

CHAS. CASPARI, JR.,
Permanent Secretary.

The following provisional programme has been arranged:

All business meetings are to be held in the Ordinary of the Windsor Hotel; local secretary's office, room No. 2, same building.

Wednesday, August 12th.

9.30 A.M.—Council Meeting.

2.30 P.M.—First General Session.

9.00 P.M.—Reception tendered by the Pharmaceutical Association of the Province of Quebec, and the Montreal College of Pharmacy, in the parlors of the Windsor Hotel.

Thursday, August 13th.

10.00 A.M.—Second General Session.

3.00 P.M.—Section on Commercial Interests.

8.30 P.M.—Section on Commercial Interests.

Friday, August 14th.

10.00 A.M.—Section on Scientific Papers.

3.00 P.M.—Electric Car Ride through the City, Outremont, Cote des Neiges, etc.

8.30 P.M.—Section on Scientific Papers.

Saturday, August 15th.

10.00 A.M.—Section on Scientific Papers.

3.00 P.M.—Section on Pharmaceutical Education and Legislation.

8.30 P.M.—Section on Pharmaceutical Education and Legislation.

Sunday, August 16th.

Devoted to rest.

Monday, August 17th.

9.30 A.M.—Trip through the Lachine Canal, Lake St. Louis and Lachine Rapids, descending the River St. Lawrence to Boucherville and Vercheres.

Tuesday, August 18th.

10.00 A.M.—Section on Pharmaceutical Education and Legislation.

8.30 P.M.—Concert in the Windsor Hall.

August 19th to August 26th.

To be arranged by Council.

J. E. MORRISON, *Local Secretary,*
43 Church Street, Montreal.

KENTUCKY PHARMACEUTICAL ASSOCIATION.

The nineteenth meeting of the Kentucky Pharmaceutical Association was held at Estill Springs, Irvine, Ky., June 16th–19th, inclusive. The meeting was eminently successful in every way. Some seventy-five members, many with their wives, were present; all actively participated in all the exercises.

Eighteen new members were elected.

The Legislative Committee was instructed to draft an entirely new pharmacy law, to be presented to the next annual meeting for ratification. It was the general impression that it would be no more difficult to pass an entirely new law than to pass the needed amendments to the old one.

The "Atchison Plan," as presented by the Kansas Pharmaceutical Association at its last annual meeting, was brought before the Association, and the protests against the sale of those patent medicines and proprietary articles which do not yield the retailer a gross profit of at least 50 per cent. were heartily concurred in.

Prof. G. L. Curry's paper, "Bacteriology for the Pharmacist," was awarded the association prize of $10 as the best scientific paper, and the paper entitled "The Retail Pharmacist," by the same author, was awarded a similar prize as the best commercial paper.

The action taken at the last annual meeting, making the Directors and Faculty of the Louisville College of Pharmacy ineligible for membership on the State Board of Pharmacy, was, after a spirited discussion, rescinded.

The following officers were elected for the ensuing year:

President—R. M. McFarland, Henderson.

First Vice-President—J. C. Hearne, Lexington.

Second Vice-President—C. F. Keener, Newport.

Third Vice-President—Dr. J. S. Leech, Glasgow.

Secretary—J. W. Gayle, Frankfort.

Treasurer—Chas. G. Morrise, Twenty-eighth and Dumesnil Streets, Louisville.

Local Secretary—A. R. Johnson, Henderson.

Chairman Executive Committee—C. Troxler, Jr., Third and Breckinbridge Streets, Louisville.

Place of next meeting will be either Cerulian Springs or Crittenden Springs—to be decided by the Executive Committee.

MEETING OF THE PHILADELPHIA COLLEGE OF PHARMACY.

PHILADELPHIA, June 29, 1896.

The stated meeting of the members of the College was held this day at 4 o'clock P.M., Wm. J. Jenks, presiding. Minutes of last stated meeting were read, as also the record of proceedings of the Board of Trustees for April, May and June, which minutes were adopted and approved, respectively. Thirteen members were present. The Chairman of the Delegates to the Sessions of the Pennsylvania Pharmaceutical Association, held at Holly Inn, Cumberland County, Mr. Wm. McIntyre, not being ready with report, Dr. C. B. Lowe gave a verbal account. Dr. Lowe also proposed that the office of the Actuary in the College should be closed during the months of June (hereafter), July and August at 5 o'clock P.M., and offered a resolution to that effect, which was subsequently amended by Prof. Trimble, by motion, to refer the subject to the Committee on Property. Amendment to original motion accepted and adopted, the Secretary being requested to refer the matter to Committee on Property, in a written communication.

The Chairman designated Prof. Henry Trimble, Prof. Jos. P. Remington and J. C. Peacock as delegates to represent this College at the coming meeting of the American Pharmaceutical Association, to be held at Montreal, August 12th. Mr. J. A. Heintzelman presented, as an illustration of trade ways that are dark but tricks that are vain, a lump of gum or crude opium, in the centre of which was deftly imbedded a spherical pebble of at least two-fifths of the weight of the whole mass. After some mild expressions of remonstrance, and charitable comment on the guileless character of the sinner who perpetrated the fraud, the meeting, on motion, adjourned.

WILLIAM B. THOMPSON,
Secretary.

NOTES AND NEWS.

Dr. J. Norman Collie has been appointed to the Chair of Chemistry in the School of the Pharmaceutical Society of Great Britain. He now holds the position of Assistant in the University College, London.

In his new position Dr. Collie will be required to take the places of both Professors Attfield and Dunstan.

The Botanic Gardens of the World is the subject of a serial article in the *Pharmaceutical Journal*, the first installment of which appeared in the issue of July 11th. The introductory points out the close relation that has always existed between botany and medicine, as illustrated by the fact that botanic gardens were originally devoted to the cultivation of those plants only from which particular remedies were derived.

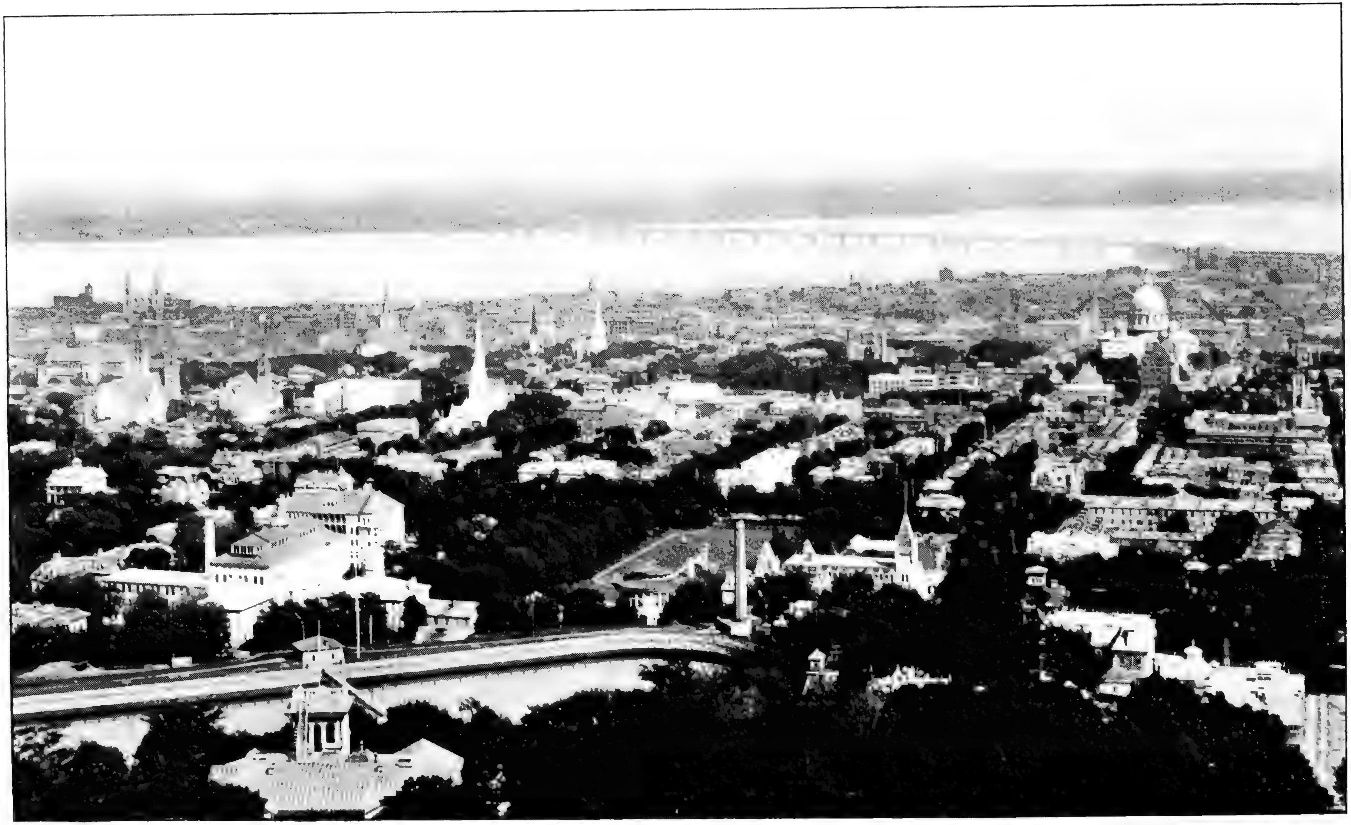
We learn, through the *Pharmaceutical Journal* of July 18th, of the death of *Friedrich August Kekule*, at Bonn, on July 13th, at the age of sixty-seven. He was successively professor at Ghent and Bonn, and was the author of the well-known theory of the benzol ring, which may be said to have created a new era in organic chemistry. His most important work was his "Lehrbuch der organischen Chemie," in three volumes (1861–67).

The *Scientific American*, issued July 25th, is especially attractive in commemoration of its fiftieth anniversary. Many illustrated comparisons are made of the present time with half a century ago. The most noteworthy subjects treated are: "The Trans-Atlantic Steamship," "Naval and Coast Defence," "Railroads and Bridges," "The Sewing Machine," "Photography," "The Phonograph," "Telegraph," "Telephone," "Progress of Printing," "The Bicycle," and "Ocean Telegraphy."

Professor John Attfield was born in 1835, and is, therefore, nearly sixty-one years of age, instead of sixty-four, as we incorrectly stated in our last issue. In addition to our brief remarks concerning him at that time, we may add that he is *sole* editor of the forthcoming British Pharmacopœia, and it is his intention to give the work imperial extension of usefulness in the colonies and India. He has always advocated the use of the metric system of weights and measures, which, in Great Britain, as in the United States, is only legalized permissively, but which will soon receive important forward impulse by adoption into the British Pharmacopœia.

Mr. J. H. Maiden, former Curator of the Technological Museum, Sydney, New South Wales, has been appointed Director of the Botanic Gardens at that place. He succeeds Mr. Charles Moore, who, after nearly fifty years of service, has retired. Mr. Maiden has, for a number of years, been identified with the economic botany of Australia, and he has published a large number of papers on that subject.

Probably his most important work is a book of nearly 700 pages, on "The Useful Native Plants of Australia." He is at present engaged on an illustrated work entitled "The Flowering Plants and Ferns of New South Wales," which is appearing in parts.



CITY OF MONTREAL FROM MOUNT ROYAL.

THE AMERICAN
JOURNAL OF PHARMACY

SEPTEMBER, 1896.

SOME RESULTS OBTAINED IN THE DESTRUCTIVE DISTILLATION OF LINSEED OIL.[1]

WITH REMARKS ON ITS BEARING ON ENGLER'S THEORY OF THE ORIGIN OF PETROLEUM.

BY SAMUEL P. SADTLER.

It is well known that, in boiling linseed oil for varnish-making and similar purposes, inflammable vapors are given off, the boiling being continued often until they burn freely. Very little has been noted with regard to the character of these vapors, and I know of no special study of them. During the past winter, in connection with the examination of some boiled oil driers for the Atlantic Drier Company, of Philadelphia, I was surprised to find some 40 per cent. of neutral petroleum-like oils in the product. The natural explanation of adulteration with mineral oils being out of the question in this case, I was led to ask as to the process used for the preparation of the boiled oil. I found that it was boiled under pressure, and that considerable quantities of a liquid distillate were being condensed in the dome of the large still and returned to the material in the still. I had the process carried out for me specially and so arranged that I could collect the product of this destructive distillation of the linseed oil, for so it proved to be.

At first the odor of acrolein was very pronounced and powerful, showing that the glycerin of the glycerides composing the oil was being decomposed; later the odor was more that of a cracked

[1] Presented at the Montreal meeting of the American Pharmaceutical Association.

petroleum oil, showing that the linoleic and other acids of the oil were undergoing decomposition. I submit a sample of the linseed oil used. It was a clear "old process" oil, of specific gravity 0·929, and showing a saponification equivalent of 183, which is normal for linseed oil. The raw distillate collected after this acrolein odor had nearly disappeared I also show. It had a specific gravity of 0 860 and a saponification equivalent of 1·09, showing that it had been nearly all converted into a neutral hydrocarbon oil.

This was then redistilled from a small iron retort and two fractions collected, leaving a residue in the retort which had the appearance of petroleum residuum or reduced oil, such as is used in the manufacture of vaseline and similar products. The two fractions were then treated with sulphuric acid, as is done in purifying petroleum distillate, and the results are shown in the samples submitted. They resemble quite strongly what is called paraffin oils, showing the characteristic fluorescence of these latter.

From a portion of one of these fractions on chilling in a freezing mixture scale paraffin was also separated, a sample of which I submit.

These results, while they can only be considered as preliminary, are sufficient to show that we have hydrocarbon oils analogous to the natural petroleum or mineral oils formed in the distillation of linseed oil under pressure. I have not yet extended this line of experiment to the other seed oils, such as cotton-seed and rape-seed oils, but believe it to be very probable that similar results could be obtained from them. I expect to do this as well as study more fully the products already obtained. I may be allowed to call attention to what seems to me to be the importance of these results in their bearing on some well-known work of Prof. Carl Engler, of Carlsruhe, Germany. In 1888 and 1889 Prof. Engler published in the *Berichte der deut. chem. Gesellschaft* (**21**, p. 1816 and **22**, p. 592), the results of experiment on the distillation of menhaden oil under pressure. He began at a pressure of 10 atmospheres and ended at 4 atmospheres. A distillate came over at 325° to 400° C., and was approximately 60 per cent. of the oil taken.

The new distillate was of brownish color, transparent in thin layers, and of a strong green fluorescence. Its odor was not unpleasant, and contained no recognizable amount of acrolein. The specific gravity of this distillate was 0·8105.

On the basis of these results Engler propounded a theory, which has been extensively discussed and generally accepted, that animal remains seem to be indicated as the main source of the formation of our petroleum deposits. His view, as expressed in the paper referred to, is that while the nitrogenous tissue of these animal deposits has disappeared as the most ready alterable portion, the fatty tissues have undergone a slow destructive distillation under pressure with the formation of our petroleum oils.

In the light of the results presented in this note on the destructive distillation of linseed oil, it is difficult to see how we can avoid widening Engler's theory so as to include the vegetable seed oils as probable additional sources of the petroleum oil formation. Moreover, I see no reason, if lard oil will yield the results which Engler has obtained, to doubt that vegetable oleins, like olive oil and its class, may also be found to be capable of the same changes.

Professor Engler showed at the World's Fair Congress of Chemists, in 1893, a refined burning oil and scale paraffin which had been obtained by him from fish oil. I have here the corresponding product, including the scale paraffin from linseed oil.

HISTORY AND NAMES OF RHAMNUS PURSHIANA (CASCARA SAGRADA).[1]

By J. U. Lloyd.

Contribution of the Research Committee of the American Pharmaceutical Association.[2]

In a paper contributed to *New Preparations*,[3] October 15, 1877, p. 8, the late Dr. J. H. Bundy, an eclectic physician of Colusa, Cal., recommended cascara sagrada as a valuable remedy in the treatment of constipation. This notice was by means of a brief note that was part of a paper on Berberis aquifolium, Dr. Bundy promising, however, to give it further attention, as follows:

"It is not my purpose to treat on cascara sagrada in this paper; but, using it in connection with the Berberis, I simply make men-

---

[1] Presented at the meeting of the American Pharmaceutical Association, Montreal, 1896.

[2] Introductory to a contribution on a chemical investigation of Rhamnus purshiana, undertaken by Alfred R. L. Dohme.

[3] *New Preparations.* Detroit: Parke, Davis & Co.

tion of it. In the future I will introduce this drug to the profession."

This, so far as the writer can determine, was the first reference concerning this remedy in pharmaceutical or medical print. Agreeably to promise, in January, 1878,[4] Dr. Bundy contributed a paper on the subject of cascara sagrada, in which he gave the uses of fluid extract of cascara sagrada. Following this came many papers from Dr. Bundy and other physicians, twenty contributions on the subject being printed in *New Preparations*, 1878, to which journal, with few exceptions, the subject was confined during 1877 and 1878. Dr. Bundy stated in his paper (1878) that: "A description of the cascara I am unable to give at this time; but suffice it to say that it is a shrub, and in due time its botanical name will be known." He neglected, however, to concern himself further in the matter.

In the fall of 1878, Dr. C. H. Adair, of Colusa, Cal., a partner of Dr. Bundy, sent the writer specimens of the bark and botanical specimens of the tree yielding it. These, on identification by Mr. Curtis G. Lloyd, proved to be Rhamnus purshiana. This fact was announced in a paper on "Some Specimens of Western Plants," presented at the meeting of the American Pharmaceutical Association held in Atlanta, Ga., November, 1878 (*Proceedings*, 1879, p. 707), and completed the drug's history.

Names.—Dr. Bundy supplied the drug under the Spanish name, cascara sagrada, which name is said to have been in local use throughout some sections of California, and soon came to be the common name of the drug. It will surely dominate all others as long as the drug is in use. The Anglicized name, sacred bark, has also been applied to the drug, and the Scriptural term, *Chittim bark*, was also employed in early days in some parts of California; but these last names are now obsolete.

Summary.—To Dr. J. H. Bundy, Colusa, Cal., 1877, is due the credit of introducing the bark of Rhamnus purshiana (cascara sagrada) to the medical profession.

To *New Preparations*, Parke, Davis & Co., of Detroit, Mich. (1877 and 1878), is due the credit of bringing the drug to the attention of physicians and pharmacists.

To Parke, Davis & Co., of Detroit, Mich. (1878), is due the credit

[4] *New Preparations*, January, 1878, p. 1.

of making the first pharmaceutical preparation (the fluid extract), and of bringing this preparation into general conspicuity through their advertisements and business connections. It may be said, without danger of controversy, that this firm introduced and established cascara sagrada as a remedy.

To Dr. C. H. Adair (1878), of Colusa, Cal., is due the credit of furnishing the botanical specimens that established the drug's botanical position.

ON THE CHEMICAL COMPOSITION OF THE OIL FROM MONARDA PUNCTATA, L.[1]

BY WILLIAM ROBERT SCHUMANN AND EDWARD KREMERS.

In a paper on the "Chemical Composition of the Volatile Oil from Monarda Fistulosa,"[2] one of us called attention to the fact that although examinations of four specimens of Monarda punctata have been recorded, none of these specimens are authentic.

In 1846 an oil of horsemint, supposed to be derived from Monarda punctata, was examined by Arppe.[3] In 1888 an examination of oils supposed to be obtained from Monarda punctata was made by Mr. Schroeter.[4] One sample of oil was taken from the cabinet of the Philadelphia College of Pharmacy, where it had been standing for six years, during which time it had deposited crystals of thymol. The other two specimens were evidently obtained in the open market, from reliable sources. However, for none of the four specimens of oil heretofore examined is there any positive guarantee given as to their source. Arppe separated mechanically a crystalline stearopten, evidently thymol, which had been deposited upon standing. Schroeter states that the oil contains a hydrocarbon of the formula $C_{10}H_{16}$; thymol, "which is dextrogyrate;" a compound, $C_{10}H_{18}O$, boiling between 240°–250°, and formic, acetic and butyric acids.

The oils used, the methods employed, as well as the description of some of the results, *e. g.*, the rotatory power of the optically

---

[1] Presented at the Montreal Meeting of the American Pharmaceutical Association.

[2] *Proc. Am. Phar. Assoc.*, 43, 256.

[3] *Annalen d. Chem. und Pharm.*, 58, 41.

[4] AM. JOUR. PHARMACY, 1888, p. 113.

inactive thymol, did not inspire confidence. Some of these odd statements have crept into the literature of volatile oils. Thus Bornemann calls attention to the supposed difference in rotatory power between thymol of oil of thyme, and that from Monarda. He also mentions that the thymol from fresh Monarda oil is non-crystallizable, whereas the crystallizability of the thymol increases with the age of the oil.

Experimental Part.—In view of the interesting results obtained upon examination of the oil from Monarda fistulosa obtained from authentic material, and some of the discrepancies that have crept into literature on the subject, another examination seemed called for. The material from which the oil was obtained was collected early in August, near Pine Bluff, about fifteen miles west of Madison, and was identified by Prof. L. S. Cheney, of the University of Wisconsin.

The flowering herb was distilled with water vapor, while still fresh, about one-half a pound of oil being obtained. The oil was of an amber or light-yellowish color, with a pleasant yet characteristic mint-like odor, sp. gr. 0·9307 at 20°. It turned the plane of polarization 0·05479 to the right at 20°, hence

$$[A]_D = + 0{\cdot}0588$$

Separation of Phenol.—In order to remove the phenol the oil was shaken with 10 per cent. caustic soda solution.

(1) From 25 c.c. of oil, shaken with 50 c.c. of the solution, 14 c.c. went into solution, or 56 per cent. phenol.

(2) A duplicate experiment gave identical results.

(3) From 150 c.c. of oil shaken with 350 c.c. of soda solution, 84 c.c. went into solution, or 56 per cent.

The alkaline solution of phenol was distilled with water vapor to remove any non-phenol portion of the oil that might have gone into solution. The solution was then acidulated with sulphuric acid and the distillation continued The distilled oily phenol was dried with exsiccated sodium sulphate and exposed to the temperature of a winter's night, when it solidified to a crystalline mass. The melting point of the dried, almost colorless crystals was found to be 50°. With chloroform and caustic soda it gave the characteristic reactions of thymol and carvacrol. The melting point, however, excluded the latter.

Non-Phenol Constituents.—That portion of the oil which was not dissolved by shaking with 10 per cent. soda solution was distilled with water vapor; 79·3 grammes of oily distillate were obtained; this was dried. Inasmuch as the original oil had been shaken only once with caustic soda, the oily distillate still gave a reaction for thymol, when tested according to Flückiger, with chloroform and caustic soda solution. This reaction, however, is very delicate and would indicate traces of phenol. The oil, deprived practically of thymol, had a specific gravity of 0·887. In a 100-mm. tube it turned the plane of polarized light 1·7166° to the right. Upon fractionation, the following fractions were obtained:

	C.c.
78°– 88°	3·5
88°– 98°	1·75
98°–166° (about)	7·0
166°–172°	4·0
172°–178°	13·0
178°–186°	0·5
186°–202°	6·0
202°	—

Fraction 172°–178°.—It was shown by Mr. Brennan, a year ago, that the oil of Monarda fistulosa contained cymene. A large yield of this fraction suggested the possibility of the presence of this hydrocarbon in this closely related oil. In order to ascertain its presence or absence, 7 c.c. of this fraction were tested with a dilute solution of 30 grammes of potassium permanganate until the color disappeared. The solution was then filtered and evaporated to dryness, the residue then dissolved in water and acidulated with sulphuric acid. A dense, whitish precipitate was formed. After recrystallization from alcohol, the melting point was found to be 155° to 156°, which is that of oxycumic acid, thus proving the presence of cymene.

Fraction 186°–202°.—On account of the small amount of this fraction, the combustion only could be made in order to ascertain the probable presence of linalool or a similar body.

(1) 0·1372 gr. of substance gave 0·1340 gr. H_2O = 0·01488 gr. H,
and 0·4145 gr. CO_2 = 0·11304 gr. C.
(2) 0·13089 gr. of substance gave 0·1285 gr. H_2O = 0·01427 gr. H,
and 0·3749 gr. CO_2 = 0·1101 gr. C.
(3) 0·1289 gr. of substance gave 0·1322 gr. H_2O = 0·0149 gr. H,
and 0·3809 gr. CO_2 = 0·10388 gr. C.

	Calculated for $C_{10}H_{18}O$. Per Cent.	Found. I. Per Cent.	II. Per Cent.	III. Per Cent.
C	77·92	82·39	78·08	80·6
H	11·69	11·84	11·25	11·6
O	10·37	6·77	10·67	7·8

These results do not agree very well, nor can the fractions after but one fractionation be considered pure. The amount of oxygen, however, makes the presence of some oxygenated substance like linalool probable.

May 31, 1896, about 30 pounds of young plants not yet in blossom were collected near Arena, Wis., by Prof. Cheney. From the partly dried herb about 118 grammes of oil, or 3·39 per cent., were obtained by distillation with water vapor. The oil possessed a slightly reddish color, and had a specific gravity of 0·925 at 20°. The rotatory power could not be taken on account of the dark color of the oil; a volumetric estimation of thymol was made.[5]

(1) *a.* 4·4580 grammes of oil, when diluted to 13·0 c.c. with petroleum ether and shaken with 5 per cent. soda solution until the volume of ether solution remained unchanged, and thymol was no longer indicated by Flückiger's re-agent. Loss of volume 3·0 c.c., equal 61·22 per cent. phenol.

b. Alkaline solution of thymol diluted to 100 c.c. with 5 per cent. soda solution.

(α) 10 c.c. of this solution required 73·5 c.c. $\frac{N}{10}$ I solution for precipitation of phenol, hence $75{\cdot}3 \times 0{\cdot}0037415 = 61{\cdot}68$ per cent. thymol.

(β) A duplicate test gave identical results.

(2) *a.* 5·7887 grammes diluted to 13·3 c.c. lost 3·9 c.c., hence 61·9 per cent. phenol present.

b. Alkaline solution of thymol diluted to 100 c.c. with 5 per cent. soda solution.

(α) 10 c.c. required 95·0 $\frac{N}{10}$ I. v. s. for precipitation of phenol, hence present 61·4 per cent. thymol.

(β) A duplicate test gave identical results.

TABLE OF RESULTS.

	Shaking Out Process. Per Cent.	As Thymol Iodide. Per Cent.
Experiment 1	61·22	61·68
" 2	61·9	61·4

PHARM. CHEM. LABORATORY, UNIVERSITY OF WISCONSIN.

[5] For the details of this process, compare "The Volumetric Estimation of Phenols," by E. Kremers and O. Schreiner.

ALCOHOL AS A SOURCE OF ERROR IN THE TITRATION OF ALKALOIDS AND ALKALOIDAL RESIDUES.[1]

By Chas. Caspari, Jr.

Methods for the volumetric determination of alkaloids in crude drugs and galenical preparations frequently include directions to dissolve the varnish-like residue (after the same has been washed with ether and dried to constant weight) in alcohol, with the aid of heat if necessary, and then to add water until a slight permanent turbidity results. A definite quantity of decinormal acid, sufficient to insure a slight excess, having been added to the mixture, the excess is titrated with centinormal alkali in the presence of a suitable indicator.

In the course of some recent analytical work, the writer observed that alcohol appeared to influence the color produced by acids and alkalies with different indicators in the titration of alkaloidal residues, and a series of experiments were, therefore, made to study more closely the nature of the changes observed, and also to determine, if possible, whether alcohol really was the disturbing factor.

Plain water, diluted alcohol (a mixture of equal volumes of alcohol and water), 94·5 per cent. alcohol (commercially known as cologne spirit) and absolute alcohol, were employed in connection with decinormal sulphuric acid and centinormal potassium hydroxide solution, as also the following well-known indicators; hæmatoxylin, cochineal, Brazil wood, methyl orange or tropæolin OO, lacmoid and litmus. Tap water was found unfit for colorimetric work, as it invariably caused an alkaline reaction with the indicators, even after having been well boiled, and pure distilled water was, therefore, employed instead. 10 c.c. of the respective liquids were put into a beaker, together with the indicator, and acid or alkali added until the desired change of color was produced.

The following results are very significant and well worthy of attention:

Hæmatoxylin solution, 1 gm. to 100 c.c. alcohol. Three drops were used for each experiment.

10 c.c. distilled water; the addition of 1 drop $\frac{N}{100}$ KOH sol. caused a decided purple color.

---

[1] Presented at the Montreal meeting of the American Pharmaceutical Association.

10 c.c. diluted alcohol required 0·65 c.c. $\frac{N}{100}$ KOH sol. to produce the same purple color, which was again destroyed upon addition of a few drops of alcohol.

10 c.c. alcohol required 1·25 c.c. $\frac{N}{100}$ KOH sol. to show a decided alkaline reaction.

10 c.c. absolute alcohol; a purple color was produced within one minute by the indicator alone, without the addition of any alkali. The color, however, disappeared upon addition of a trace of decinormal acid.

Cochineal solution, 10 gm. to 100 c.c. 25 per cent. alcohol. Five drops were used for each experiment.

10 c.c. distilled water required 6 drops (about 0·2 c.c.) $\frac{N}{100}$ KOH sol. for a decided alkaline reaction, indicated by a purplish-red (onion-red) color.

10 c.c. diluted alcohol required 0·80 c.c. $\frac{N}{100}$ KOH sol. to produce the same color, which was again destroyed by a few drops of alcohol.

10 c.c. alcohol required 1·4 c.c. $\frac{N}{100}$ KOH sol. to produce the same color.

10 c.c. absolute alcohol required 0·1 c.c. $\frac{N}{100}$ KOH sol. to show the alkaline reaction.

Brazil-wood solution (U. S. P. test solution), 10 gm. to 20 c.c. water, with subsequent addition of 2 c.c. alcohol. Ten drops were used for each experiment.

10 c.c. distilled water required 5 drops $\frac{N}{100}$ KOH sol. to produce the pink color indicating alkalinity.

10 c.c. diluted alcohol required 1·0 c.c. $\frac{N}{100}$ KOH sol. to produce the same color, which was again destroyed by a few drops of alcohol.

10 c.c. alcohol required 1·6 c.c. $\frac{N}{100}$ KOH sol. to show the alkaline reaction.

10 c.c. absolute alcohol required 0·25 c.c. $\frac{N}{100}$ KOH sol. to produce the desired pink color.

Lacmoid solution, 1 gm. to 500 c.c. 50 per cent. alcohol. Ten drops were used for each experiment.

10 c.c. distilled water required 2 drops $\frac{N}{100}$ KOH sol. to produce a decided purplish-blue color.

10 c.c. diluted alcohol required 0·45 c.c. $\frac{N}{100}$ KOH sol. to produce the same color, which was again destroyed by a few drops of alcohol.

10 c.c. alcohol required 0·7 c.c. $\frac{N}{100}$ KOH sol. In this case the purplish-blue color produced was discharged by a large excess of alkali.

10 c.c. absolute alcohol. A decided blue color was produced by the indicator alone, which was not changed by addition of an excess of alkali.

Litmus solution (aqueous solution). Four drops were used for each experiment.

a. 10 c.c. distilled water; a purplish-red color was produced by the indicator alone.

b. 10 c.c. distilled water required 2 drops $\frac{N}{100}$ KOH sol. to produce a decided purplish blue color.

10 c.c. diluted alcohol required 0·2 c.c. $\frac{N}{100}$ KOH sol. to produce the same color as in *a*.

10 c.c. diluted alcohol required 0·65 c.c. $\frac{N}{100}$ KOH sol. to produce the same color as in *b*. The color was again destroyed by addition of a few drops of alcohol.

10 c.c. alcohol required 1·10 c.c. $\frac{N}{100}$ KOH sol. to produce the same color as in *b*.

10 c.c. absolute alcohol produced the same color as obtained in *b* with the indicator alone.

Tropæolin OO or methyl orange solution, 1 gm. to 500 c.c. 50 per cent. alcohol. Two drops were used for each experiment.

a. 10 c.c. distilled water, upon addition of 1 drop $\frac{N}{10}$ H_2SO_4, gave the characteristic pink color, showing an acid reaction.

b. 10 c.c. distilled water, with 0·1 c.c. $\frac{N}{10}$ H_2SO_4, gave a decided crimson color, showing a strong acid reaction.

c. 10 c.c. diluted alcohol required 1·10 c.c. $\frac{N}{10}$ H_2SO_4 to produce the same color as in *b*.

10 c.c. alcohol, with 3·5 c.c. $\frac{N}{10}$ H_2SO_4, failed to produce the same color as in *b*; a deep orange-red color was produced, which gradually, on further addition of 1·25 c.c. $\frac{N}{10}$ H_2SO_4, changed to crimson.

10 c.c. absolute alcohol failed to produce a crimson color with 4 75 c.c. $\frac{N}{10}$ H_2SO_4.

d. 10 c.c. distilled water, treated as under *b*, required 0·97 c.c. $\frac{N}{100}$ KOH sol. to produce a strong yellow color indicating alkalinity.

10 c.c. diluted alcohol, treated as under *c*, required only 10·20 c.c. $\frac{N}{100}$ KOH sol. to produce the same color as in *d*.

From the foregoing reactions it is very evident that alcohol and absolute alcohol, as available in the market, exercise a decided influence on color indicators, and may be the fruitful source of error in volumetric work. Strange to say, while alcohol appears to play the part of an acid toward hæmatoxylin, cochineal, Brazil wood, lacmoid and litmus, by requiring an increased quantity of alkali to produce the characteristic alkaline color reaction, it behaves quite differently towards methyl orange or tropæolin OO. In the latter case alcohol seems to lend to the indicator a strong alkaline reaction, requiring a phenomenal amount of decinormal acid to produce the characteristic acid color. The fact that absolute alcohol appears alkaline towards all of the above indicators is remarkable, and, while no further examination of the article was undertaken, it is but fair

to say that it was the product of a well-known, reliable American manufacturer. The alcohol used was such as is usually sold to pharmacists by the jobber as prime cologne spirit.

If, then, alcohol plays so important a part in color reactions, it is more than likely that its presence will influence more or less the results obtained in the titration of alkaloidal residues, and hence it should be rigidly excluded in all such work if accuracy is desired. It may be employed to bring the impure (often resinous) residue into solution, so that the decinormal acid can dissolve the alkaloid more readily, but should invariably be dissipated by the application of heat before titration of the acid solution is undertaken.

To show the effect of alcohol on the valuation of alkaloids, and to point out more forcibly the necessity for the absence of this solvent in such operations, four alkaloids—morphine, cocaine, atropine and strychnine—all of American manufacture, were assayed volumetrically both in aqueous and dilute alcohol solution. Quinine and cinchonine cannot be determined volumetrically like the other alkaloids above mentioned, because when in acid solution, prepared exactly like the others, both give an alkaline color indication with cochineal and tropæolin; with hæmatoxylin and Brazil wood, although the reaction at first is acid, an alkaline reaction occurs before the excess of acid is neutralized, and hence results entirely too high are obtained.

The solutions used in making the following determinations were so prepared that 100 c.c. of finished product contained 0·500 gramme of alkaloid and 20 c.c. of decinormal acid; 10 c.c. of this solution were used for each titration, centinormal alkali solution being used to determine the excess of acid. The equivalent of 1 c.c. $\frac{N}{100}$ KOH solution in $\frac{N}{10}$ H_2SO_4 was determined for each indicator, so that accurate calculation as to percentage could be made. The proportion of pure alkaloid determined in both the water and the dilute alcohol solutions is given opposite each indicator for the sake of ready comparison, the quantity of indicator used having been the same as stated in the experiments with plain solvents, mentioned above. Two extra determinations were made in the case of each alkaloid, with hæmatoxylin and tropæolin OO, after addition of 5 c.c. alcohol to the dilute alcohol solution; this was done for the purpose of showing the effect of a larger proportion of alcohol, whereby the detrimental influence of the latter liquid is emphasized.

MORPHINE.

Indicator.	Water Solution.	Diluted Alcohol Solution.
	Per Cent.	Per Cent.
Hæmatoxylin	98·58	96·05
Cochineal	98·48	95·26
Brazil wood	98·32	89·68
Tropæolin OO	98·55	105·44
Lacmoid	98·91	97·56
Litmus	98·41	94·05

In the case of tropæolin the diluted alcohol solution required the addition of 1·53 c.c. $\frac{N}{10}$ H_2SO_4 before a decidedly acid color was obtained and satisfactory titration made possible.

After addition of 5 c.c. of alcohol to 10 c.c. of the diluted alcohol solution, the following results were obtained:

	Per Cent.
With hæmatoxylin	89·00
With tropæolin OO, requiring the addition of 3·4 c.c. $\frac{N}{10}$ H_2SO_4,	107·68

COCAINE.

Indicator.	Water Solution.	Diluted Alcohol Solution.
	Per Cent.	Per Cent.
Hæmatoxylin	97·26	94·65
Cochineal	96·35	95·02
Brazil wood	95·95	90·71
Tropæolin OO	97·26	104·23
Lacmoid	97·44	96·53
Litmus	96·35	92·83

In the case of tropæolin the diluted alcohol solution required the addition of 1·56 c.c. $\frac{N}{10}$ H_2SO_4 before a decidedly acid color was obtained and satisfactory titration made possible.

After addition of 5 c.c. of alcohol to 10 c.c. of the diluted alcohol solution, the following results were obtained:

	Per Cent.
With hæmatoxylin	92·84
With tropæolin OO, requiring the addition of 3·2 c.c. $\frac{N}{10}$ H_2SO_4,	106·65

ATROPINE.

Indicator.	Water Solution.	Diluted Alcohol Solution.
	Per Cent.	Per Cent.
Hæmatoxylin	99·89	96·82
Cochineal	100·08	97·33
Brazil wood	99·75	94·62
Tropæolin OO	100·02	105·58
Lacmoid	100·38	97·95
Litmus	98·20	91·49

In the case of tropæolin the diluted alcohol solution required the addition of 1·52 c.c. $\frac{N}{10}$ H_2SO_4 before a decidedly acid color was obtained and satisfactory titration made possible.

After addition of 5 c.c. of alcohol to 10 c.c. of the diluted alcohol solution, the following results were obtained:

	Per Cent.
With hæmatoxylin	92·95
With tropæolin OO, requiring the addition of 3·2 c.c. $\frac{N}{10}$ H_2SO_4,	108·09

STRYCHNINE.

Indicator.	Water Solution.	Diluted Alcohol Solution.
	Per Cent.	Per Cent.
Hæmatoxylin	97·03	94·59
Cochineal	97·43	94·25
Brazil wood	96·53	89·11
Tropæolin OO	97·19	103·54
Lacmoid	98·03	97·19
Litmus	92·11	84·03

In the case of tropæolin the diluted alcohol solution required the addition of 1·5 c.c. $\frac{N}{10}$ H_2SO_4 before a decidedly acid color was obtained and satisfactory titration made possible.

After addition of 5 c.c. of alcohol to 10 c.c. of the diluted alcohol solution, the following results were obtained:

	Per Cent.
With hæmatoxylin	87·64
With tropæolin OO, requiring the addition of 3·3 c.c. $\frac{N}{10}$ H_2SO_4,	110·22

QUININE.

Although quinine, for reasons already stated above, cannot be titrated in the same manner as the other alkaloids mentioned, the effect of alcohol can nevertheless be observed. Decinormal hydrochloric acid was used in place of sulphuric acid to avoid fluorescence, and hæmatoxylin was employed as the indicator.

When titrated in water, the result showed 117·18 per cent.; when titrated in a mixture of alcohol and water (equal volumes), the result showed 112 79 per cent.

It is possible that alkaloids and alkaloidal residues may be titrated with a fair degree of accuracy in alcoholic or hydro-alcoholic solution, provided the relation of the centinormal alkali to the decinormal acid has been previously determined for the particular indicator to be employed, in the presence of the alcohol or the mixture of alcohol and water; but this necessitates extra labor, as well as a knowledge of the proportion of alcohol present, since an increase or decrease of the latter materially affects the equivalent.

The following tables show at a glance the variation in the relation of alkali to acid, as indicated by color reactions, in the presence of different mixtures of alcohol and water. The presence of alcohol, moreover, seems to have a direct influence on the color produced by the indicator, and the changes are by no means as sharp as in water alone, and in some cases are even observed with difficulty, thus rendering the titration results less reliable. The decinormal sulphuric acid used was standardized by precipitation as barium sulphate, and found to contain 0·004889 gramme H_2SO_4 in 1 c.c. With this acid the centinormal alkali solution was standardized, phenolphtalein being used as an indicator.

A. TABLE SHOWING THE NUMBER OF C.C. $\frac{N}{100}$ KOH SOLUTION NECESSARY TO PRODUCE A NEUTRAL OR FAINTLY ALKALINE REACTION WITH DIFFERENT INDICATORS WHEN 10 C.C. $\frac{N}{10}$ H_2SO_4 ARE TITRATED IN THE PRESENCE OF 60 C.C. OF DISTILLED WATER, ALCOHOL, AND MIXTURES OF ALCOHOL AND WATER.

Indicator.	Distilled Water.	Alcohol, 1 Volume. Distilled Water, 2 Volumes.	Alcohol, 1 Volume. Distilled Water, 1 Volume.	Alcohol, 2 Volumes. Distilled Water, 1 Volume.	Alcohol, 94·5 Per Cent.
Phenolphtalein . . .	100·16	104·39	106·72	106·76	109·24
Hæmatoxylin . . .	98·17	100·54	100·83	101·53	103·15
Tropæolin OO . . .	98·42	96·93	96·11	94·70	74·65[1]
Cochineal	98·52	101·20	101·79	102·96	104·07
Brazil wood	98·57	102·09	103·10	104·28	106·28
Lacmoid	99·06	100·44	101·13	101·50	102·71
Litmus	98·66	102·69	103·40	104·93	106·32

[1] Color very difficult to distinguish.

B. TABLE SHOWING THE EQUIVALENT OF 1 C.C. $\frac{N}{100}$ KOH IN DECINORMAL SULPHURIC ACID WHEN TITRATED WITH DIFFERENT INDICATORS IN THE PRESENCE OF DISTILLED WATER, ALCOHOL, AND MIXTURES OF ALCOHOL AND WATER.

Indicator.	Distilled Water.	Alcohol, 1 Volume. Distilled Water, 2 Volumes.	Alcohol, 1 Volume. Distilled Water, 1 Volume.	Alcohol, 2 Volumes. Distilled Water, 1 Volume.	Alcohol, 94·5 Per Cent.
	C.c.	C.c.	C.c.	C.c.	C.c.
Phenolphtalein . . .	0·09984	0·09579	0·09414	0·09367	0·09154
Hæmatoxylin . . .	0·10186	0·09946	0·09917	0·09849	0·09694
Tropæolin OO . . .	0·10160	0·10316	0·10405	0·10559	0·13396
Cochineal	0·10150	0·09881	0·09824	0·09712	0·09609
Brazil wood	0·10144	0·09795	0·09699	0·09589	0·09409
Lacmoid	0·10094	0·09956	0·09887	0·09842	0·09736
Litmus	0·10135	0·09738	0·09671	0·09530	0·09405

The only explanation that can be offered for this peculiar behavior of alcohol is on the basis of Arrhenius' theory of electrolytic dissociation, as detailed in the writings of Professor Ostwald. According to the latter authority, indicators also depend for their value entirely upon dissociation, and although the various alcohols have a dissociating effect upon salts held in solution by them, it is less marked than in the case of water, and decreases with the increasing molecular weight of the alcohol.

The conclusions forced upon us as a result of the observations above enumerated are, that far more accurate volumetric determinations of alkaloids and alkaloidal residues can be made in water alone than in mixtures of the same with alcohol, and that the error caused by the latter is augmented as the proportion of alcohol is increased.

BALTIMORE, MD., July, 1896.

GELATINE CAPSULES.[1]

BY WM. C. ALPERS.

I. HISTORY OF THE CAPSULE.

During the last fifty years, the filled and empty gelatine capsules have become of such general use among physicians and pharmacists that a short history of their origin and development may not be without interest. Our Pharmacopœia ignores them entirely, and the various handbooks on pharmacy contain but very scant information on this useful article.

In compiling the following notes, the writer consulted the libraries, public and private, of New York, as far as they were accessible; and while he thinks that he has recorded all that is desirable to know on this subject, he cannot claim that nothing has been overlooked or forgotten, and will be glad to receive additions or corrections. He is greatly indebted for much valuable information to the firms of H. Planten & Co. and E. Fougera & Co., of New York; to Parke, Davis & Co. and the Merz Capsule Company, of Detroit, Mich., and to the authors of the various pharmaceutical manuals.

---

[1] Presented at the Montreal Meeting of the American Pharmaceutical Association.

The gelatine capsule was invented by Mr. A. Mothes, a French pharmacist, in 1833. Experiments had evidently been made before, but no evidence of success nor public acknowledgment can be found before this date. Official notice of the discovery was taken by two reports to the "Académie royale de Médecine," one on May 13, 1834, the other on February 28, 1837, both of which speak approvingly of it. On March 15, 1837, Dr. M. F. Ratier, a prominent physician and teacher of Paris, inserted in the *Dictionaire de Médecine et de Chirurgie practiques* (Vol. XV, page 285) an article on "Thérebinthine de Copahu," in which he speaks of the happy idea of the gelatine capsules, which admit of direct administration of either balsam of copaiva or its volatile oil without any addition liable to alter its virtues. There is, therefore, no doubt that this invention was at once welcomed by the medical and pharmaceutical professions as a safe method of administering nauseating liquids. The capsules were known after their inventor, as "Capsules Gelatineuses de Mothes," and were manufactured and sold by the firm of Mothes et Dublanc, of Paris. At first, only capsules filled with balsam of copaiva were made; afterwards various nauseating liquids, principally oils, were treated in the same way. Soon a demand for empty capsules arose, and the firm supplied them also. The method of making these capsules was described by Mr. Cottereau, in an article in the *Traité de Pharmacologie*, early in 1835. A small pouch, made of a soft skin, shaped like a small olive, served as a mould. This pouch was fastened by means of a wax thread to a small long-necked funnel of metal, the upper wide opening of which could be closed with a screw cover. Through this funnel the pouch was filled with mercury in order to expand it. A solution of gelatine and water was made in the proportion of 1 part of gelatine to 3 of water, and the expanded pouch dipped into it. On withdrawing, a rotary motion was given the instrument until the gelatine had almost hardened; if desired, a second or third dipping might be used. The cover of the funnel was removed and the mercury poured out, by which the pouch would collapse and could easily be withdrawn. The neck of the capsule was then cut, leaving a small opening, through which it was filled by means of a syringe. Finally, a drop of the gelatine solution would close the capsule.

In 1838, Mr. Garot, a pharmacist of Paris, read a paper before the

Pharmaceutical Society of Paris (*Journal de Pharmacie*, 1838, p. 78), in which he states that the manufacturers of capsules having refused to sell empty ones, he was forced to invent a plan of his own, in order to fill certain prescriptions of local physicians who did not wish to have the formula communicated to others. He proceeded by making a mass of the cubebs and copaiva and other substances, and divided and rolled the mass into pills. He then made a gelatine solution, using 1 part of gelatine to 3 of water, put the pills on needles, dipped them into the liquid, rotated them in the air until the gelatine was losing its liquid consistency, and kept them on the needle by inserting the blunt end into a thick paste. After preparing about fifty pills, he would take each needle and warm it gently at a candle, the heat being sufficient to melt the gelatine around the needle to allow the latter to be withdrawn. A warm spatula and a trace of liquid gelatine would finally close the hole left by the needle. It will be seen that this is substantially the method used in later years by the manufacturers of gelatine-coated pills, although other methods are now employed by some. Mr. Garot, therefore, was the inventor of the gelatine-coated pill, in 1838. Two years later (*Journal de Pharmacie*, 1840, p. 585), Mr. Vée proposed an improvement in the coating material by using one part of gelatine, seven parts of jujube, and water enough to dissolve both to a syrupy consistency. This mass would prevent the cracking of the coating caused by the rapid drying and contraction of the gelatine, and also leave a pleasant flavor in the mouth after swallowing the pill. Another modification was recommended in 1848 by Mr. M. G. Jozeau (*Gazette Médicale de Paris*, 1848, **III**, 193), by substituting casein for gelatine.

Returning to the capsules, it must be noted that the process invented and employed by Mr. A. Mothes was a rather complicated one, and we cannot wonder that ingenious minds looked for improvements. Such an improvement is recorded in the *Journal de Pharmacie et de Chimie* (Vol. 1846, p. 354), by Mr. A. Giraud. He took small, iron, olive-shaped balls with a wire attached to one end, and, after covering them with a thin coat of sweet almond oil, dipped them into a solution of syrupy consistence, of 24 parts of gelatine, 4 parts of syrup of acacia, 6 parts of simple syrup, and 20 parts of water. The coated moulds were suspended by means of the wire, until the gelatine was cold enough to be touched by the fingers,

when he would grasp each one with the hand and briskly withdraw the mould. The gelatine mass was elastic enough to expand and contract again. Mr. Giraud finally asked whether there would be legal objections to using this method. The answer is given in a foot note, stating that this process cannot be used, as it interferes with the patent of Mr. Mothes. It seems, however, that Mr. Mothes himself took advantage of this paper, for, in 1850, that is, four years later, we find in the *Journal de Pharmacie et Chimie* (Vol. 1850, p. 204), a communication signed H. B., to the effect that "Mr. Mothes has introduced an improvement in making his capsules, in order to overcome the variations in size, by taking iron moulds of the shape of an olive suspended by wires." Then follows the same description that Mr. Giraud had given before, without giving him the credit of the invention. We must surmise that French manufacturers, just like their American brethren, are in the habit of re-inventing, whenever the original inventor is careless enough to publish his invention without patenting it at once. From this time the gelatine capsules were generally used by the French pharmacists and physicians, and we find many evidences in the various French pharmaceutical journals. Formulas for certain mixtures are recommended, ending generally with the phrase: "Then fill into gelatine capsules, and close them in the usual way." It might be mentioned that in 1878 (*Journal de Pharmacie et de Chimie*, 1878, **II**, p. 74), Mr. Detenhof gives again a description of a method of making capsules, which differs from Giraud's method only in the material. Detenhof used 7·4 gelatine, 14·4 water, and added 14·4 glycerin; he was probably the first one to recommend glycerin in the gelatine mass.

The French Pharmacopœia also took notice of this invention, and we find an official formula for the manufacture of the gelatine capsule in the edition of 1866 of the "Codex Medicamentarius." The mass employed consisted of gelatine, 30 parts; gum arabic, 30 parts; sugar, 30 parts; white honey, 10 parts, and water, 100 parts. The process differs from that of Giraud, in so far that the olive-shaped iron moulds are not provided with a wire, but are soldered with their elongated necks to a small plate, so that after dipping them into the gelatine solution they would stand erect until sufficiently dry to withdraw them from the mould. The last edition of the German Pharmacopœia also recognizes the capsules, and gives a similar formula. Also in other countries the capsules soon became

very popular, and experiments to improve the method of their manufacture were made by many pharmacists.

In the *Repertorium für die Pharmacie* (1840, XXIV, 2, p. 158), we find an article on "The Formation of the Gelatine Capsule," by Adolph Steege, court apothecary at Bucharest. He provided his moulds with wooden handles fitting snugly into perforations of a wooden plate. Putting about fifty such moulds into position, he dips them into the gelatine solution and then rotates the whole apparatus in the air until the gelatine has become solid enough to be handled. Taking each handle from the plate, he cuts the gelatine neck at the proper place, and pulls the capsule off the mould. This process is substantially still in use to-day, according to "Remington's Pharmacy," third edition, p. 1231, where the apparatus used by Parke, Davis & Co. is illustrated and described.

In 1845, two French pharmacists, Evans and Lescher, invented a process by which a small animal membrane, made of the small intestines of the sheep, was used as a covering. A description of their invention is given in the *Pharmaceutical Journal and Transactions*, 1845–46, p. 361; but as it was only short-lived, a repetition seems unnecessary.

It must not be forgotten that the capsules so far mentioned were, without exception, olive-shaped, and had to be closed with a drop of gelatine solution. They were hand-made and naturally expensive. The French manufacturers exported them to all countries, but it seems that they preferred to sell filled capsules of various formulas, and while the pharmacists of other countries handled them, the capsules did not become of general use. To us the question—how they were introduced into American Pharmacy—is of particular interest.

The first mention of gelatine capsules appears in the AMERICAN JOURNAL OF PHARMACY, of 1835, New Series, Vol. I, p. 351, giving a short translation of Cottereau's article in the *Traité de Pharmacologie*, without any commentary. Only two years later we find in the same journal (AM. JOUR. PHARM., 1837, New Series, Vol. III, p. 20), a lengthy article on "Capsules of Gelatine," by Alfred Guillou, graduate of the Philadelphia College of Pharmacy, which is well worth copying:

Provide a suitable number of narrow tin dishes, about 18 or 20 inches in length, ½ inch deep, and about 2 inches in width. In the length of these and

in a line, plant or solder at a distance of 1 inch from each other a number of smoothly formed metallic knobs of an ovoid shape, whose apex having been somewhat lengthened out, forms a thin neck by which they are attached to the tin dishes. This neck may be about ½ of an inch in length. Procure a sheet of tin and perforate with round holes, of which the diameter will be equal to the thickness of the knobs. Having greased the knobs well with lard, so as not only to prevent any adhesion to them, but also the adhesion of the inner sides of the capsules to each other after casting, pour melted glue (the most transparent having been selected) upon them, and allow it to become tolerably stiff. If you think the shell is too thin, a second coat may be poured upon the first. The capsule having been coated, this cast is allowed to cool down to the ordinary consistency of India rubber, and having run a knife around the neck, you twist it briskly around and pull it upwards off the knob. It will immediately collapse and lose the form imparted to it on the mould, but if laid aside to dry, will, by the time it has hardened, have regained the desired rotundity. Place it upon your perforated plate or "filler," and you can thus conveniently fill it with the article prescribed, and close the opening with a piece of goldbeater's skin.

It will be noticed that Mr. Guillou used glue instead of gelatine, and also recommended iron moulds soldered by their necks to small tin plates, and therefore devised the instrument which is now official in the French Pharmacopœia. As this article was written in 1837, that is, nine years before Mr. Giraud recommended his iron mould with wires, there is no doubt that Guillou, an American student of the Philadelphia College of Pharmacy, was the first inventor of the improved process for making capsules, preceding even Steege's invention by five years. I have not been able to discover whether any practical results came from this discovery; the records of the Patent Office do not mention any patent for capsules at that time, nor have I found the inventor's name anywhere later.

The real capsule industry in America dates from 1836, when Mr. H. Planten emigrated from Paris and established a capsule business at No. 3 Chambers Street, New York, at the place where the East River Savings Institution is now located. Filled capsules, according to French formulas, were manufactured after the process of Mothes, and new ones added whenever a demand arose. The capsules were first sold as "Mothes' capsules" and the labels printed in French and English. Powders were also put in the capsules, if ordered. Capsules in two parts were also made, the lower part filled and then capped. But their manufacture was soon abandoned as unpractical, the two parts rarely fitting well. The firm of H. Planten, now H. Planten & Son, never patented any machinery and invariably declined

to announce their methods. How long they adhered to Mothes' original process, or when improvements were made is, therefore, impossible to say. The old firm of B. Keith & Co. also attempted to introduce empty gelatine capsules and manufactured them here about 1860, but soon abandoned the attempt. E. Fougera & Co., of New York, also imported French capsules for many years, but during the last twenty years the domestic capsules, on account of their cheapness, superseded those imported.

In 1863, the firm of H. Planten took up the industry of empty capsules for powders and liquids. The first capsules intended for powders alone were called by them jujube paste capsules and were offered to the trade before 1870. Another manufacturer, Dundas Dick, also experimented in the same direction and secured a patent on cone-shaped capsules as early as 1865. The first inventor, however, to manufacture capsules, as now used, by machinery, to devise ingenious apparatus for their production on an extensive scale, and to render their use popular in pharmacy, was Mr. F. A. Hubel, of Detroit. He secured his first patent for a capsule machine February 13th, 1877, although he had already manufactured and sold empty capsules as early as January, 1875. (See Parke, Davis & Co. price-list of 1875.) From this date till 1883, we find a long list of patents in the records of the Patent Office, some of them granted to Mr. Hubel, some to other inventors. Disputes as to priority soon arose, and lawsuits followed, in which Mr. Hubel was victorious. His whole output is brought into the market by Parke, Davis & Co. The following is the process employed by him, which I copy *verbatim* from a letter that Parke, Davis & Co. had the kindness of sending me in answer to my inquiry:

"Metal moulds set in metal plates are first lubricated and then dipped into solution of gelatine. They are withdrawn at a regulated speed, the solution being of a given temperature, and that temperature being higher according as the temperature of the moulds is lower and *vice versa*. The temperature of the moulds and of the solution, and the speed at which the moulds are withdrawn, determine the thickness of the capsule. The solution comprises 7 parts of water to 4 of gelatine. After dipping, the gelatine investment is allowed to congeal sufficiently and it is then cut by a special cutting machine, and the waste about the cut is shoved away from the capsule. The capsules are dried by passing a current of

air over them, and when dry and hard are stripped from the mould by machine. The caps are joined to the bodies by hand, and at the same time defective capsules are sorted out and rejected. The finest quality of gelatine is alone suitable. The one other process we are familiar with varies from the foregoing only in the fact that after dipping the moulds, the capsules are allowed to dry wholly, or almost wholly, before stripping."

I also quote from a letter of "The Merz Capsule Company," of Detroit, who write: "In order to make capsules properly and sufficiently cheap, it requires a large amount of complicated and expensive machinery and constant attention to small details, inasmuch as the $\frac{1}{1000}$ of an inch difference, more or less, in the thickness of a capsule will either make it a loose-joining or a tight-joining capsule."

The last invention on the field of capsules is that of Mr. Heineman, who now manufactures empty elastic capsules for fluids.

"By means of these the druggist is enabled himself to fill elastic capsules as occasion may require, perfectly and without loss of time, doing the work as well as the capsule manufacturer himself could do the same in the factory. The convenient shells will keep almost indefinitely, are always ready for use, and enable the druggist not alone to avoid carrying a large stock of filled capsules, but enable him to dispense freshly-made capsules containing an almost indefinite variety of formulas with whatever variations physicians may be pleased to give them from time to time, as the needs of the patient may require."

The use of the gelatine capsule is daily extending, not only in medicinal and pharmaceutical adaptation, but also for mechanical purposes of varied kinds. They are employed for beef-juices and other extracts, for candies and chocolates, for inks and bluing. The latest use to which they are put is for packing cigars, in order to better preserve the flavor, and daily new ideas appear in which the gelatine capsule may take part in due time.

2. FILLING THE CAPSULE WITH POWDERS OR PILL MASS.

There exists a great diversity of opinions as to the proper way of dispensing medicinal media in gelatine capsules. While some pharmacists claim that a mass should always be prepared, others contend that the only proper way is to fill the mixture of the various

items of the prescription in powder form into the capsule. Under certain circumstances both may be right. Physicians are not always explicit in writing prescriptions, and often omit to state in what form they wish the medicine administered. If they would simply add "fiat *massa* in capsulas dividenda," or "fiant *pulveres* in capsulas dividendi," all doubts would be dispelled. But there are only a few who do this, and as long as the *modus operandi* is left to the judgment of the pharmacist, a definite rule should be adopted.

The public in general prefer capsules filled with *powder*, and all pharmacists know the sometimes very troublesome customer who will insist on having his 20 grains of quinine put into ten capsules, because "they act better that way." The argument that a dry powder is more readily dissolved or absorbed than a more or less compressed pill, is a very plausible one and hard to refute. In reviewing prescriptions on which capsules are ordered, we will find that the majority, almost 65 per cent., are orders for pills, that is to say, they contain ingredients whose mixture will result in a pill mass. Vegetable extracts of more or less soft consistency, oils of various natures, articles like oxgall or ichthyol, and similar drugs, all these can only be prepared in pill form; for to make powders of them would require an addition of so much absorbing powder, as to make the powders unreasonably large. To this class we must also count those prescriptions that contain delinquescent salts or such chemicals which by their mixture will turn moist or liquid. There can be no question about such prescriptions and our investigation is, therefore, restricted to prescriptions, that are composed only of dry ingredients, or in which the amount of liquid medicaments, like a few drops of some ethereal oil, is so small that it will be readily taken up by the solid ingredients without the addition of any absorbing powder. What is ordered in such cases, powders or pills?

Let us take analogous cases. Would a pharmacist think of changing a prescription for pills into one for powders, or one for powders into a liquid? Is it not the rule to dispense conscientiously whatever is ordered, and not alter a prescription in the least, unless the limits of safety have been transgressed? Why then should a mixture of drugs ordered in powder form be changed into a pill mass? A capsule is, according to all authorities, a cover for nauseating or strong-smelling medicines; no teacher or encyclopædist restricts its

meaning to pills alone. A pharmacist, therefore, has no right to suppose that a physician wishes to order a pill mass when he orders powders, especially as the prescriber has it in his power to add the words "fiat massa," and thereby express such desire if it existed. Where, however, such a remark is wanting, there is no reason why a mass should be formed. *Powders*, not *pills*, are ordered to be put into capsules, and the pharmacist who changes the powders into a mass doubtlessly transgresses the limits of his professional liberties. And what other motive to do so can there exist but the desire to save time and labor? The tendency of late years to prepare prescriptions at lower prices than all the competitors, and sacrifice everything to cheapness, has reduced not only the time allotted to each prescription, but also the care and solicitude so necessary in the fulfilment of our professional duties. It goes quicker to make a mass and cut into so many parts than to carefully weigh each powder, and let the accuracy with which the last powder balances the calculated weight serve as a proof of the correctness of all powders.

It is claimed that in many instances the bulk of the dry powder would necessitate a very large capsule, while a mass could be compressed to a much smaller volume. In answer to this argument we must not forget that it is not the pharmacist's province to regulate the bulk of the medicine, or to correct a physician, as long as the dose is within the limits of safety. If a physician chooses to order a mixture containing as a dose $\frac{1}{60}$ grain of strychnine dissolved in a tablespoonful of some aromatic liquid, no pharmacist would consider it his duty to change the tablespoon to a teaspoon, and thereby reduce the bulk of this medicine to one-fourth of the prescription under the plea that the bulk of the dose was too large. If, therefore, the physician orders a powder to be put into capsules and the largest capsules alone will hold the prescribed dose, there is no reason why the pharmacist should change the order. Nor is it always true that a mass will reduce the bulk. In the first place, it is always necessary to add some excipient, if it be only water, thereby adding to the weight; very often adhesive vehicles, as gum acacia, tragacanth, various mucilages or glycerites are needed to form the mass. The danger of adding a little too much of a liquid vehicle, and then being compelled to correct the mistake by adding some solid, often increases considerably the bulk of the mass with-

out adding to its medicinal properties. Furthermore, while all these ingredients may be perfectly harmless, if considered by themselves, they may yet change the finely comminuted powder to a hard lump, which, instead of being easily assimilated by the patient, would pass undissolved through the system or even be the cause of serious digestive disorders. Lastly, we may also state that although there are people who prefer small capsules to large ones, there are just as many who will take a large capsule as readily as a small one.

A few words may be added about the filling of capsules, which seems to be a difficult task to some pharmacists. Whenever a mass is first prepared, little difficulty is experienced. The general procedure is to roll the mass and cut it into the required number of pieces, in such a way that each piece has the shape of a small cylinder, of a diameter a little smaller than that of the body of the selected capsule. The operator should then wash his hands, in order to remove all traces of the mass, and then introduce the small cylinders into the capsules by means of a needle with which he picks them up. As especially fit for this work, I mention the small botanical needles used in dissecting flowers, which are provided with a wooden handle, an instrument that every pharmacist can prepare himself. The covers are afterwards put on with the fingers. By this method, the odor as well as the taste of the ingredients of the mass are thoroughly covered by the capsule. Care should be taken not to select too large a capsule, so that the mass after drying will fill only half the space ; but even with the greatest care in preparing the mass a shrinking will afterwards take place, an inconvenience which it seems impossible to overcome.

During the last year, I have given this method of filling capsules my special attention, and compared repeatedly the cylindrical parts of the mass by weighing them. In very rare instances have I found two parts that weighed exactly the same, the variation in my own work ranging from a fraction of 1 per cent. to 3 per cent., in spite of the greatest care exercised. Experiments with masses cut by other operators showed a similar, sometimes worse, result. I have discovered two apparently equal pieces of the same mass to vary as much as 8 per cent. In most instances this lack of exactness seems to be irrelevant, but we must admit that if we once allow a variation it is hard to draw a limit. I have therefore adopted a better and more correct method, and during the last six months instructed my

assistants to weigh the mass, divide the weight by the number of capsules ordered, and then weigh each part separately before putting it into the capsule. Objection might be raised that this is a troublesome and tedious procedure; but this is not so. By using the metric weight a division is quickly made, and the weighing of from 12 to 20 small parts requires no longer time than the rolling and cutting.

To introduce powders into the capsules is not quite so simple, and requires a small apparatus to insure correct results. Some pharmacists resort to the rather crude method to put the powder, without dividing it, on a piece of paper, take the body of the empty capsule between the fingers in the left hand and the cover in the right, and fill both by shoving them through the powder repeatedly. This method, which is even recommended in one of the newer works on pharmacy as the best means of filling capsules, is objectionable in more than one respect. In the first place, it is impossible to gauge the quantity of the powder that is thus introduced into the capsule, and repeated weighing of each capsule becomes necessary, until the correct weight is reached, sometimes after many trials. Secondly, the very object of the capsule is entirely ignored; particles of the mass will adhere to the outside, and neither taste nor odor of nauseating medicines can afterwards be entirely removed. A capsule filled with quinine in this manner will taste bitter no matter how often it is wiped after filling, and if the mass should contain such strong-smelling ingredients as asafetida or valerian, their odor can never be removed. The proper way, insuring correctness and elegance, is to weigh each powder separately, and introduce it into the empty capsule by means of a small apparatus, of which various kinds are in the market. There is Reymond's capsule filler, consisting of a block of wood with a number of sockets for the empty capsule, and a second block with a corresponding number of funnel-shaped receptacles. Another instrument, the Davenport capsule filler, consists of a metal funnel for the capsule and a plunger. Both these and other apparatus have their advantages and drawbacks.

I have here an instrument which I think is an improvement on the others. It consists of a base (*Fig. 2*), with a number of small plugs, and a block (*Fig. 1*), with a corresponding number of holes into which the plugs fit; these holes are widened at the upper side into small funnels. At the sides are pegs as guides for the upper

block, so that each hole will be exactly over each plug. In the centre of the baseboard there is a small metal rod with a thread for a screw-nut at the upper end; the nut for this thread is held on the upper side of the perforated block by an overlapping flange, and can be turned easily by means of a pair of wings. A short plunger

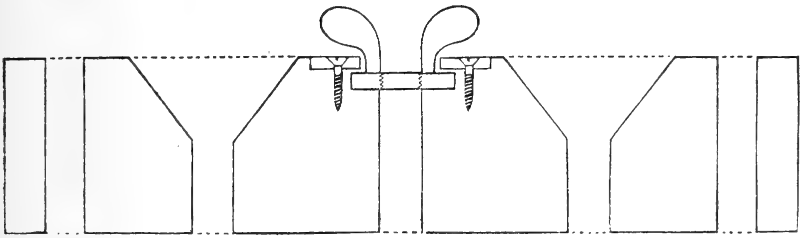


Fig 1

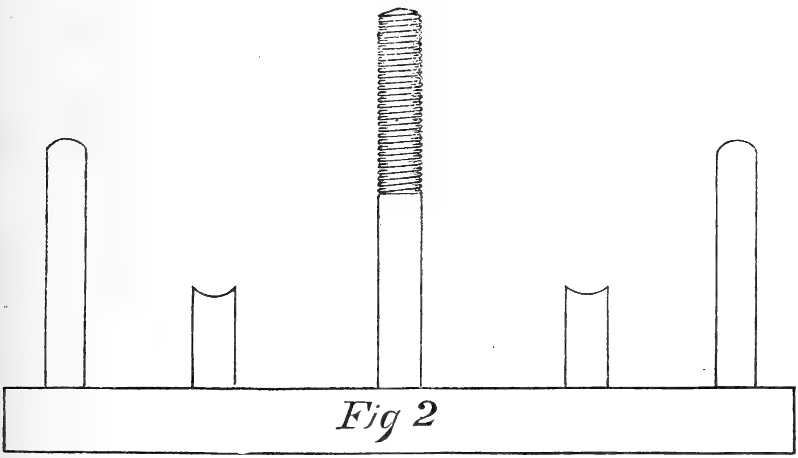


Fig 2

Fig 3

(*Fig. 3*), concave at one end and convex at the other, completes the apparatus.

The *modus operandi* explains itself. The two blocks are arranged so as to place the upper one over the lower one; the empty capsules are introduced and pushed by means of the plunger into the per-

foration until they touch the plugs; if necessary, the upper block is lowered by means of the screw until the upper parts of the capsules are even with the funnel-shaped widening of the perforations; the powders, each one having been weighed, are put into the funnels and pressed down with the concave end of the plunger, leaving a small elevation over each capsule for the hollow of the cover. By a few turns of the nut the capsules are now partially raised out of their casings, high enough to put the covers on; these latter might be moistened inside with a trace of water by means of a camel's hair pencil, and thereby glued on. After the covers are put on, a few additional turns of the screw will raise the capsules entirely out of the casings.

As a *résumé* I would submit the following rules:

(1) Always follow the physician's directions as to the formation of a mass.

(2) If no directions are given, form a pill mass whenever the ingredients cannot be mixed in powder form. Weigh the mass, divide the weight by the number of capsules ordered, weigh each part and give it the shape of a small cylinder by rolling it between the thumb and first finger. Wash the fingers and introduce the cylinders into the capsules by means of a needle.

(3) If no directions are given, and the ingredients of the prescription will form a powder, divide their combined weight by the number of capsules ordered, weigh each powder separately, and introduce it in powder-form into the capsule by means of a convenient apparatus. Under no condition should the undivided powder be forced into the capsules by moving the bodies and covers through the powders from opposite directions.

The Indian Pharmacologist is the title of a new journal established at Calcutta, under the editorship of Dr. Lawrence Fernandez. The first number, issued July 1st, contains articles by David Hooper on "A Pharmacopœia for India;" on "The Value of Quinine," by Sir William Moore; and on "Formulæ for Disguising Flavors," by R. W. Gardiner.

Mr. Joseph Ince, lecturer on pharmacy in the Pharmaceutical Society of Great Britain, has resigned. Mr. Ince has been associated with the Society, in one way or another, since a very early period in its history. In addition to his literary work in connection with the *Pharmaceutical Journal*, he served as member of the Society's Council for a number of years.

EDITORIAL.

THE AMERICAN PHARMACEUTICAL ASSOCIATION.

The members of the American Pharmaceutical Association assembled at Montreal this year under the most favorable conditions for a successful meeting, except the one temporary drawback of high temperature; this, however, had practically disappeared before the first session convened, and, therefore, did no more harm than to keep a few members at home. All the sessions were well attended, notwithstanding the fact that there was an absence of the tension which prevailed at the two preceding meetings, in the shape of alcohol legislation and college requirements. In regard to the former it may be said that those in favor of tax-free alcohol evidently consider it hopeless to try to get any concessions from Congress, if a majority of the members of this Association are opposed to a removal of the tax. Concerning college requirements, the members have evidently come to a realization of the fact that they have no jurisdiction over the colleges. The best the Association can do is to make recommendations, which was done mildly this year in some of the papers presented to the Section on Education and Legislation.

In the general sessions, business was conducted promptly and without much friction. Some of the reports of committees were unnecessarily lengthy, but before they ran the gauntlet in the general meeting or one of the sections they were sufficiently trimmed to prevent them from doing harm, and in most cases they did or will do good.

The Section on Commercial Interests was the source of some uneasiness to the members in general, and, prompted by the feelings of anxiety for the reputation of the Association, they attended the one session of this Section in a body. Chairman Seabury, however, "is nothing if not original," and this year he had a surprise in store in the shape of answers to the queries which had been propounded to members. These queries he embodied in his address, with the answers thereto, which he had received from five members. The answers he had tabulated, so that in one short hour the combined address and papers were disposed of. The Chairman apparently satisfied the members present by his statement, backed by one from the Secretary of the Section, in reference to the journal known as the *Mortar and Pestle*, whose publication by the officers of the Commercial Section, soon after the Denver meeting, was a surprise to most members of the Association, but which came to an untimely end after the issue of four numbers. The Chairman, however, declared his intention to continue the publication. Nevertheless, the Association was quick to disclaim any responsibility, and a motion was carried to expunge all reference to the publication from the minutes, and to direct that the name of the Association should not be used in connection therewith.

The Section on Scientific Papers was the most successful one at the meeting. Its proceedings were delayed considerably by the report of the Committee on Pharmacopœia, which had been referred to it by the General Session. This report, when it left the Scientific Section, was so clipped as not to be recognizable. The members of the Association are not yet ready to make themselves ridiculous in the eyes of the Committee of Revision of the U. S. P., by suggesting sweeping changes; for example, the substitution of artificially pre-

pared oils for the natural ones—a question, by the way, which would require years of research work before it could be intelligently answered.

The papers presented to this Section were not as numerous as in some previous years, and while no one of them was entitled to be considered of a high order of merit, still the average was good, and probably this tended to insure the large attendance and the full discussion at the meetings of this Section. The Committee on Research produced as much in the way of results as could reasonably be expected of it in one short year, and it will probably become a very valuable part of this Section.

Much credit is due Professor Prescott for the able manner in which he has pushed this work.

The Section on Education and Legislation had less than a dozen papers presented to it, many of which were devoted to discussing the duties of State Boards of Pharmacy. Professor Beal, in his report as Secretary, made the rather sweeping assertion that a State is as well off without as with a State Board of Pharmacy, unless the latter has the sympathy and support of a State Pharmaceutical Association. Taken as a whole, the meeting was an eminently successful one, and the entertainment provided by the Canadians contributed in no small degree to this end.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

LES ALCALOIDES DES QUINQUINAS. Par E. Léger, avec une préface de M. E. Jungfleisch. Paris: Société d'Éditions Scientifiques. 1896. Pp. 278.

The literature of the alkaloids has become so extensive, that an author who takes up a group of them and gives the subject the comprehensive treatment which Mr. Léger has in this volume deserves the gratitude of all those who have to do with the study of plant principles.

The first chapter treats of the cinchona barks, their origin, history, chemical composition, and classifies the alkaloids derived from them. Chapter II considers the group of the alkaloids in general. In Chapters III to XIII, inclusive, each alkaloid is taken up and considered separately, and its composition, identification and separation detailed.

The last chapter is devoted to the chemical constitution of the alkaloids of the group.

In treating of this part of the subject the author limits himself to a consideration of quinine, quinidine, cinchonine and cinchonidine, and he makes out that much has been done towards establishing the chemical constitution of these compounds.

Finally, the value of the book is very much enhanced by some thirty pages of a bibliographical index. We regret very much that in compiling this the author has limited himself to the French and German literature of the subject. Only such English references as have been abstracted into journals in those languages has found a place, and all titles have been translated into the French language.

Notwithstanding this drawback in its bibliography, the work as a whole is a most valuable one, and we should be glad to see it translated into the English language in order that its circulation might be extended as far as possible.

LES FERMENTS SOLUBLES (Diastases—Enzymes). Par Émile Bourquelot. Paris: Société d'Éditions Scientifiques, 1896. Pp. 220.

Chapter I is devoted to the definition and classification of the soluble ferments. The remaining chapters take up the various ferments which have been classified, and consider their origin, preparation, composition, action and the results of the action of physical and chemical agents. A final chapter discusses the theories of fermentation.

Each chapter in the book is followed by a list of references, which, as a whole, make a valuable bibliography of the subject. Many of the ferments considered are of immediate interest to pharmacists, for example, diastase, maltase, pepsin, papain, etc., and the whole book forms a complete monograph on the ferments that will well repay one for the reading.

ANNUAL REPORT OF THE CLERK OF FORESTRY, for the Province of Ontario. By Thomas Southworth, Clerk. Toronto, Ont., 1896.

The whole of this pamphlet of 132 pages is of interest to foresters, agriculturists and the general reader. The sections which are especially attractive to the pharmacist are "The Uses for Forest Products," "Trees as Industrial Resources" and "Gall Insects Infesting Canadian Oaks." Forestry in Canada, as in the United States, is attracting the attention of many economic students, and the desirability of intelligent treatment of the subject is as important for the well-being of that country as it is for our own.

CONTRIBUTIONS OF THE U. S. NATIONAL HERBARIUM. Vol. III, No. 9. U. S. Department of Agriculture, Division of Botany.

This number comprises the following contributions:

I. Flora of Southwestern Kansas. Report on a collection of plants made by C. H. Thompson in 1893. By A. S. Hitchcock.

II. Crepis Occidentalis and Its Allies. By Frederick V. Coville.

III. Plants from the Big Horn Mountains of Wyoming. By J. N. Rose.

IV. Leibergia, A New Genus of Umbelliferæ from the Columbia River Region. By John M. Coulter and J. N. Rose.

V. Roseanthus, a New Genus of Cuburbitaceæ from Acapulco, Mexico. By Alfred Cogniaux.

In the first of these papers 193 species of plants, representing 42 natural orders, and in the third 84 species, are catalogued. The second, fourth and fifth papers are illustrated.

CATALOGUE OF THE UNIVERSITY OF WISCONSIN FOR 1895–96. Madison, Wis., 1896.

ANNUAL ANNOUNCEMENT FOR 1896-97, DEPARTMENT OF PHARMACY, SCIO COLLEGE, Scio, O.

TWENTY-FIFTH ANNUAL CIRCULAR OF THE NATIONAL COLLEGE OF PHARMACY. Washington, D. C., 1896.

CHICAGO COLLEGE OF PHARMACY. THE SCHOOL OF PHARMACY OF THE UNIVERSITY OF ILLINOIS. Thirty-seventh Announcement, 1896–97.

PROSPECTUS OF THE COLLEGE OF PHARMACY OF THE CITY OF NEW YORK, 1896–97.

BRITISH PHARMACEUTICAL CONFERENCE.

The thirty-third annual meeting of the British Pharmaceutical Conference was held at Liverpool, England, July 27 to 30, 1896. For the following information we are indebted to the *Pharmaceutical Journal* and the *Chemist and Druggist*, in their issues of August 1st.

The sessions of the Conference proper were begun with the customary address of welcome on the part of the city authorities, after which the President, William Martindale, delivered his address.

Mr. Martindale's work in connection with the "Extra Pharmacopœia," and his numerous official services, as well as his long and active interest in the development of both the sciences of medicine and pharmacy, were factors which went far to fix, in the minds of his hearers, the belief that the questions demanding attention would receive at his hands careful and able consideration. Nor in this were they disappointed.

The President reviewed the history of pharmacy back to a time shortly prior to the Liverpool meeting, twenty-six years ago, and, in giving reminiscences of the papers read at that meeting, it was curious that the adulteration of beeswax with paraffin was attracting the attention of pharmacists then as now. In speaking of the advances made in this period, he said:

"We may take the year 1868 as the commencement of a new epoch—the beginning of a great physiological and chemical awakening in regard to the uses of chemicals as medicinal agents. It was also memorable by the passing of our Pharmacy Act, and the inauguration of a system of compulsory examination and registration. . . . But, adhering to our date, 1868, let me draw your attention to the important medical agents that are now largely used, which were then either not in existence or were mere chemical curiosities.

"I have already mentioned amyl nitrite and the nitrites. Chloral hydrate was first exhibited at our Exeter meeting, in 1869, by Daniel Hanbury, and by the following year had created a great sensation. Its homologue, butyl-chloral hydrate, has also since been largely used. Boric acid was but a chemical rarity previous to 1875; it is now produced in tons for medicinal use, as well as for the purpose of preserving milk and foods. Regarding the desirability of the latter use of it there may be difference of opinion, but there can be little doubt of its utility and value in hot climates, although it is being superseded by a new competitor in the field—formic aldehyde."

After referring to a number of antiseptics introduced within this period, the speaker mentioned the active principles of drugs, the synthetic alkaloids and the synthetic coal-tar products which have come extensively into use in ophthalmic surgery, local anæsthesia, and as hypnotics.

In calculating the cost to the purchaser, the President maintained that the qualifications of those engaged in dispensing drugs and medicines should be taken into consideration, and his own words may be used to illustrate this opinion.

"The pharmacist, therefore, as a chemist, must be worthy of this name, and it is now legally held that in all cases the individual seller of a poison must be a qualified and registered person. The pharmacist has the responsibility of selling poisonous, as well as other medicines, and his care and attention, both in storing and selling them, need to be continually exercised. Not only so, but he must be a judge of the quality, as well as chemically able to test his wares, of which the public, in most cases, can be no judges. Hence, his remuneration is not for material supplied, but for special service rendered, and is, therefore, in many cases, out of proportion to the actual commercial value of his commodities. This applies to the simple sale of drugs, though the argument is much stronger when applied to the compounding of medicines. The special training, therefore, of the individual seller or compounder must necessarily enhance the cost of medicines to the public, who are safeguarded by such training."

The progress of elegant pharmacy was then dwelt upon at some length by the speaker.

"Pharmacy being the handmaid of medicine, it is our duty to aid the medical practitioner and to be in touch with his requirements wherever our assistance may be of service to him.

The application of the pharmacist's art can and should in numerous ways help him much more than is the case at present, although great advances have been made in this respect within the period I have been considering."

The President deplored in a somewhat radical manner the lack of a knowledge of pharmacology on the part of medical men, but placed the blame with the conjoint board of the Royal Colleges of Physicians and Surgeons of London.

"For their examination there is now no stipulated time required to be devoted to the subjects of pharmacy and materia medica, or even to chemistry. All that is necessary is that the students' schedules are signed. There is no examination at all in practical dispensing, and now there is no separate examination in pharmacology, which may be defined as the knowledge of the physiological and therapeutic action of drugs, or the action of medicinal agents on the body in health and disease, so that a student may pass his qualifying examination, in which this subject—pharmacology—only forms a section of Part I (Medicine), knowing comparatively little or nothing of it. . . . This new departure is certainly casting discredit on the use of medicine as a factor in the healing art. 'In five or six years hence,' a medical writer has said, 'we shall have growing up around us men, who from sheer timidity, will rarely venture to prescribe anything but the simplest remedies,' and 'the unfortunate qualified practitioner,' after devoting 'the best years of his life to the acquirement of much useless knowledge . . . ignorant of the means of alleviating the sufferings of his patients, will, in despair, fall back on the preparations of the advertising chemist.'"

The speaker concluded his address after mention of the subject of the organic serums, lymphs and animal extracts in connection with the future of pharmacy, by referring in an eulogistic manner to the labors of Pasteur, Darwin and Huxley on biology, and indirectly on medicine, surgery and pharmacy.

The President's address occupied thirty-three minutes, after which followed the reception of delegates, the reports of the Executive Committee, Treasurer and Formulary Committee.

The preliminary exercises having been concluded, the next in order was the reading of original communications.

The first was on

THE PHARMACY OF CONIUM MACULATUM.

By E. H. Farr and R. Wright.

The authors gave quite an extensive *résumé* of the history of conium, the reputation of which as a remedial agent seems to have been in a state of fluctuation from ancient times to the present, when it is again falling into disrepute among medical men, due chiefly to the fact that most of the pharmaceutical preparations of the drug are practically inert. The statement was made that up to the year 1887 no work had been done on the pharmaceutical side of the subject at all commensurate with that accomplished on the medical side. In that year the method of Cripps for determining gravimetrically the value of conium, which consists in the isolation of the alkaloids and their conversion into hydrochlorates, was devised, and was subsequently adopted by the authors in their investigations of the drug and its preparations. It was with the object of adding to the more definite knowledge of conium from the pharmaceutical standpoint that the work described in the paper was undertaken. Specimens of the hemlock plant were selected at different stages of its growth, and the alkaloidal value of the different parts determined. The results were as given in the following table, which shows the percentages of alkaloidal hydrochlorates :

Stage of Development.	Source.	Roots.	Stems and Stalks.	Leaves.	Flowers with Peduncles.	Green Fruits.
Young plants, 4 to 6 inches high	Uckfield.	·047	·017	·031		
Plants, 4 feet high, taken before flowering	Hitchin.	·022	·019	·120		
Plants, 3 feet to 3 feet 6 inches high, showing incipient inflorescence	Uckfield.	(*a*) Cortex. ·031 (*b*) Axis. ·032	·037	·090		
Plants, 5 feet high, in full flower	(*a*) Uckfield.	·050	·064	·187	·236	
	(*b*) Ashford. Derbyshire.	·018	·012	·075	·086	(1) ·725 (2) ·975

The average loss of weight on drying was: Roots, 77 per cent.; stems and stalks, 86 per cent.; leaves, 79 per cent.; flowers, 80 per cent., and fruits, 68 per cent.

Samples of fresh green fruit yielded the following percentages of alkaloidal hydrochlorates:

Year.	1.	2.	3.
1892	·935	·975	—
1893	·896	1·049	1·088
1896	725	·975	—

These results were thought to confirm those of previous investigators. The authors suggested that in a future Pharmacopœia the green fruit only shall be retained. They also recommended the introduction of a fluid extract of the fruit from which the other preparations may be made. Reference was made to the fact that in the United States Pharmacopœia all preparations of conium, except the extract and fluid extract made from the fruit, have been discarded.

JAPANESE FENNEL AND ITS OIL.

By John C. Umney.

Japanese fennel, as stated by the author, was quite different in appearance from the fennel fruits from Southern Europe and India, and, upon casual observation, had the appearance of anise, but, upon closer examination, was found to be distinctly different. On distillation the fruits yielded 2·7 per cent. of a pale yellowish oil, having a specific gravity of ·9754 at 15° C., and an optical rotation of 15·5 in a 100-mm. tube. It solidified at — 7° C. when stirred, and became liquid again at — 10° C. About 75 per cent. of anethol was determined to be present in the oil, in addition to fenchone and terpines. The oil from Japanese fennel, therefore, appeared to differ but little from normal oils from other fruits, and corresponded well with the requirements of the U. S. Pharmacopœia.

RADIOGRAPHY.

By Leo Atkinson.

In this communication the author gave a brief sketch of the rise and uses of X-ray photography, and observed that the variability in transmission of X-rays by different bodies is not a more pronounced phenomenon than the well-known diathermic properties of many bodies. He claimed that the knowledge of chemistry and physics possessed by the pharmacist makes him specially qualified to undertake the practice of radiography, and referred to some of the discoveries made by this means, stating that many sophistications of foods and drugs can be detected by its aid.

NOTE ON THE STRENGTH OF SOME OF THE SUCCI.

By E. H. Farr and R. Wright.

The authors' attention was drawn to this class of preparations by an experience with a stock sample of succus conii, which, upon examination, was found to be practically valueless. Five samples (in two cases six) of the following succi were examined: Belladonnæ, conii, hyoscyami and scoparii. The results indicated that the average strength of succus belladonnæ is almost twice as great as that of the tincture, while that of succus conii and succus hyoscyami is, in each case, much below the average of the corresponding tincture.

NOTE ON CONCENTRATED HYDROBROMIC ACID.

By Charles T. Tyrer.

It was stated that an examination of this acid for sulphur compounds was attended with negative results. The conclusion was reached that a specific gravity of 1·250 should be the highest degree of concentration for the official acid.

NOTE ON HYPOPHOSPHOROUS ACID.

By Charles T. Tyrer.

The author commented on several of the processes for the preparation of this acid, but was of the opinion that the acid made by the careful decomposition of barium hypophosphite by dilute sulphuric acid is the best. It was found not to deposit on long standing, and when of a specific gravity of 1·137 contained 30 per cent. of pure hypophosphorous acid.

A SAFETY PIPETTE.

By E. W. Lucas.

This instrument consisted of an ordinary pipette, with a somewhat elongated mouthpiece, with two constrictions about an inch apart. The upper constriction was ground smooth inside, the lower one was imperfect, while between the two was a loosely-working glass plug. The pipette was operated in the usual way, and when the liquid reached the plug this was forced into the second constriction which it fit accurately, thus preventing the farther rise of the liquid.

CASCARILLIN.

By W. A. H. Naylor and R. D. Littlefield.

The work of the authors was two-fold—to determine the true character of the cascarillin obtained by Allessandri with the use of oxalic acid, and to see how far this body and the cascarillin of Duval corresponded in composition to the formula of C. and E. Mylius. The product obtained by Allessandri's process

lost 50 per cent. on purification. The remaining portion was identical in melting-point and behavior toward reagents with the principle obtained according to Duval's method. A combustion of the pure cascarillin gave the formula $C_{16}H_{24}O_5$. It melted at 203·5° C. C. and E. Mylius assigned to the principle obtained by them the formula $C_{12}H_{18}O_4$, and a melting-point of 205° C. The fact that the substance isolated by the authors yielded a distillate allied to anthracene ($C_{14}H_{10}$) when heated with zinc dust was considered an indication that their formula is nearer the truth. The process of Allessandri, which has been recommended as a commercial one, was, therefore, regarded as untrustworthy.

BELLADONNA ROOT POWDER; SEPARATED SIFTINGS COMPARED.

By R. H. Parker.

A sample of belladonna root was lightly ground and separated into "fine," "medium" and "coarse" powders, by means of sieves, 60, 40 and 20 meshes to the inch. After examination of these portions separately the results showed that the fine powder gave a darker-colored tincture, but contained less alkaloid; and that the removal of the finer portion of belladonna root powder, to the extent of 40 per cent., made the remainder of about 30 per cent. increased alkaloidal potency.

TABLET-MAKING AT THE DISPENSING COUNTER.

By S. Hardwick.

This paper was full of practical information, and the author showed how, with very simple apparatus, tablets of a great variety of medicaments can be skilfully dispensed.

THE EFFECTS OF CLIMATE AND SOIL ON OILS OF PEPPERMINT.

By John C. Umney.

In a previous investigation the author found that the principal difference between black and white Mitcham (England) oils was in the proportion of esters of menthol present, the latter having the higher percentage of these constituents. Moreover, the white had a greater optical activity and gave a deeper blue color with acetic and nitric acids. An authentic sample of oil distilled in the United States from white peppermint was not obtained, but samples from black Mitcham plants were found to vary somewhat, the oil from Wayne County, N. Y., having a higher ester percentage than that yielded by Michigan plants. The results further showed that the black Mitcham plant when grown in the United States yields an oil closely resembling the white. It was considered unlikely that the higher percentage of Wayne County, as compared with other American oils, was due solely to superior methods of distillation. The oil from Japanese peppermint did not appear to be much affected by conditions of climate and soil, that distilled in England and the United States being very similar to the native product.

ON WHITE WINE VINEGAR.

By Alfred H. Allen.

The results of analyses of the genuine article were given. It was also stated that genuine wine vinegar always contains a notable quantity of potassium bitartrate, which is not present in vinegar from other sources. Analysis showed

that dilute acetic acid was supplied in fourteen cases where white wine vinegar was called for.

CONDENSED MILK.

By Alfred H. Allen.

The commercial brands were divided into three classes, those made by concentrating milk to one-third of its original volume and usually adding a preservative, those treated with cane sugar—about 40 per cent.—after concentration, and those treated in a special manner with a view to approximate human milk. Complete analytical data regarding various brands led to the conclusion that much of the sweetened milk is unfit for ordinary purposes unless largely diluted, when it becomes much weaker than pure milk. The author also condemned the statement often made on labels that for infants' use the preparation should be diluted with from 6 to 14 parts of water, as the observation of such directions could not fail to lead to serious results.

NOTES ON POTASSA SULPHURATA.—COTTONSEED OIL.—THE PRONUNCIATION OF PHARMACOGNOSY.

By W. Elborne.

The author showed that the green and dark green varieties of sulphurated potash were prepared from the lower grades of commercial carbonate of potash, and when dissolved in water afford a dark, turbid solution; sample prepared from purer carbonates (90 per cent. K_2CO_3) yielded a product of a dull yellow or greenish-yellow color, freely soluble in water without turbidity. The latter was suggested as an addition to the Pharmacopœia, and, furthermore, that its solubility in rectified spirit might be restored to 75 per cent.

Cottonseed oil was condemned as a substitute for olive oil in ointments, liniments and like preparations, on the authority of a therapeutist who had found it to produce irritant effects.

The opinion was expressed that pharmacognosy should be pronounced with the "g" silent, and the accent on either the first or second "o."

FORMALDEHYDE AS AN ANTISEPTIC.

By F. C. J. Bird.

The statement that formaldehyde may be added to certain liquids as a preservative and subsequently driven off by the application of heat was proven to be erroneous. The author found, after a number of experiments, that aqueous liquids retained this substance with the greatest pertinacity, and that it was almost impossible to remove the last traces. Infusions appeared to keep better when a tuft of cotton moistened with the antiseptic was suspended in the bottle, than when it was added direct to the contents. The former method was thought to have the further advantage of less formaldehyde being retained. The author saw no objection to its use as a preservative when employed in this manner.

NOTES ON PYROXYLON B. P.

By Charles T. Tyrer.

It was found that most of the formulæ given in text-books for making pyroxylon were either unreliable or were wanting in precision. These objections were sought to be overcome by experiments described in detail in the paper. The U. S. P. formula yielded a better product than the B. P. process.

The practice of keeping pyroxylon in water was considered objectionable, as decomposition is thus brought about.

INDIAN BAEL AND ITS PREPARATIONS.

By A. C. Abraham.

The pulp was regarded as the active portion of the fruit, and clinical experiments to support this claim were brought forth. Some portions of the B. P. process for making the fluid extract were somewhat obscure, but were elucidated by the author with the result that a more satisfactory preparation was obtained. The recognition of bael fruit, by the British alone, of European Pharmacopœias, indicated the indifference with which it was regarded.

LIQUOR AURI ET ARSENII BROMATUS.

By R. Wright.

The following formula was submitted as speedy and reliable:

Arsenious acid (in powder)	40 grains.
Potassium carbonate	40 "
Bromine	100 "
Gold (in leaf)	13·5 "
Distilled water, sufficient for	1 pint.

Boil the arsenious acid and potassium carbonate with 4 ounces of distilled water until solution is complete. Add 12 ounces of distilled water to the gold-leaf placed in a wide-mouthed bottle, then run in the bromine and shake until the latter is dissolved. Add the first solution and shake for a few seconds. Transfer to a flask and boil until bromine fumes cease to be given off. Allow to cool; add distilled water to make 1 pint and filter.

ESSENCE OF RENNET.

By J. A. Forret.

The speed with which the author's method can be carried out was the principal point in its favor. Three or four calves' stomachs, preserved in the dry condition, were macerated for one hour in 50 ounces of a 10 per cent. solution of salt, repeating this operation twice. To the strained liquids ½ per cent. of boric acid and 10 per cent. of alcohol were added, filtration being facilitated by the addition of about an ounce of kaolin.

THE EFFECT OF SOLVENTS ON THE ANALYTICAL CHARACTERS OF GINGER.

By J. F. Liverseege

The author instituted a series of experiments for determining the character of the commercial article, but concluded that probably the simplest way of detecting sophistication with spirit of ginger was to determine the cold water and methylated spirit extracts.

CHINESE OPIUM.

By Frank Browne.

In a previous paper the author communicated some notes on the smoking value of Chinese opium. On further observation he came to the conclusion that, as regards narcotizing power, the extracts of Chinese opium are inferior to the opium of India, although the former contain large quantities of morphine.

THE COMPOSITION OF DIPHTHERIA ANTITOXIN SERUM.

By Gordon Sharp.

The proteid bodies isolated were of the same character as those in normal serum. No alkaloids or characteristic crystals could be detected, and all efforts to obtain a ferment yielded only negative results. Albuminose was present, but was more abundant in samples which had been kept for some time.

The reading of papers and the discussions having been brought to a close, after occupying four sessions, the question of next year's meeting was brought up, and an invitation to hold the Conference in Glasgow in 1897 was accepted.

The following officers were then elected for the ensuing year:

President, C. Symes; Vice-Presidents, Walter Hills, J. Laidlaw Ewing, W. F. Wells and R. McAdam; Treasurer, John Moss; Honorary General Secretaries, W. A. H. Naylor and F. Ransom; Honorary Local Secretary, J. A. Russell; Executive Committee, F. C. J. Bird, George Coull, E. H. Farr, John Foster, Prof. Greenish, T. H. Wardleworth, Edmund White, J. C. Umney and R. Wright.

AMERICAN PHARMACEUTICAL ASSOCIATION.

The forty-fourth annual meeting of the American Pharmaceutical Association convened in Montreal, Canada, on Wednesday, August 12, 1896. The Windsor Hotel was the headquarters of the Association, and, in the ordinary of that building, at 3.45 P.M. on the day mentioned, President J. M. Good called the meeting to order in

FIRST GENERAL SESSION.

He then introduced Mr. R. W. Williams, President of the Pharmaceutical Association of the Province of Quebec, and, afterwards, Mr. W. H. Chapman, President of the Montreal College of Pharmacy. Both of these gentlemen welcomed the members of the Association to the metropolis of the Dominion in very friendly words.

The Chair then asked Prof. E. L. Patch to reply to the remarks of the previous speakers, which he did in an amusing and interesting address. After First Vice-President C. E. Dohme had been called to the chair, the President read his address. Among other things in the course of his remarks, he said:

Probably the most important special committee working during the past year was the one appointed on weights and measures, with instructions to co-operate with the American Metrological Society and other societies in petitioning Congress to pass a law making the use of the metric system compulsory at an early date, in all transactions where weights or measures or both are used. That they almost succeeded is a fact probably well known to all of you. That they did not succeed absolutely is no cause for discouragement. The wonder is that they did so well, when we reflect what it means to a nation to change a system of weights and measures—a system which is absolutely without system, but which, by education and use, has become a part of ourselves. All classes are affected. Fully a generation of people have grown from childhood to maturity in America since the active agitation of this subject began. It must be persistently pressed by scientific organizations, and more thoroughly taught in all our schools, before the people will be ready to accept it in measuring values in the daily transactions of life. Every family has the weights used in the vicinity and recognized by the custom of the place. To change all this at once is to affect the well-being of every man, woman and child in the community. Those opposed to the change in England are much gratified at having so able an ally as Herbert Spencer. One does not like to see so

great a man as he on the wrong side of any question. When he proposes to change our arithmetic, adopt a duodecimal notation in place of the one now in use, and construct an entirely new system of weights and measures to correspond, he is not likely to have much of a following. Tried for his offence by a jury of his peers, he is quite certain to be condemned. He has been ably answered by one of our members. We trust that it cannot long be said, reproachfully, that Great Britain and the United States are the only two influential nations which have not adopted the metric system of weights and measures.

The speaker expressed himself as pleased, also, with the work which the Committee on the Status of Pharmacists in the Army and Navy of the United States had done. He hoped the naval apothecary would finally be granted at least the same rank and pay as the surgeon-major. An event of importance in the work of the Association, this year, is the issuing of a new edition of the National Formulary. The first edition was a popular work, and the second is an improvement on that.

Continuing, the speaker said: Considering the suggestions embodied in the report of the delegates to the Section on Materia Medica and Pharmacy of the American Medical Association, it would undoubtedly be desirable to have introduced into the Pharmacopœia a table of average doses of remedies. This would make the book more popular with druggists, as well as among the physicians. There are difficulties in the way of preparing such a table for a work that is authoritative and likely to be used as such in cases of prosecution. A physician might hesitate to administer an apparently excessive dose of any remedy, even though the exigencies of the case seemed to demand it, if it were possible to use such an authority against him. Furthermore, when doctors disagree, who shall say what is an average dose of any particular drug. It is thought possible, if a carefully-worded text accompany the table, that these objections will lose their force, and the expression "average dose" has the merit of being a more elastic one than "maximum dose." I should be in favor, therefore, of a resolution by this Association, requesting the introduction into the next Pharmacopœia of a table of average doses of official drugs and their preparations.

As to the second proposition—to admit certain of the "new remedies" into the Pharmacopœia—it seems to me to deny official recognition to any medicinal agent which is protected by proprietary rights, is indisputably the correct ethical position. Any of that character which are now so honored, and "which cannot be produced otherwise than under a patented process," should be dismissed. The physician is not by such action deprived of their use as remedial agents. Notwithstanding the fact that many of these synthetic compounds possess positive therapeutic value, and skill and knowledge have been exercised in their production, until our patent and trade-mark laws can be so changed as to protect the public against extortion, they should continue to bear the "stigma of illegitimacy." Probably many of the claims which have been set up under the trade-mark and copyright laws would be found to be fictitious if properly contested. Certainly a law which will allow a person to register the name of a drug as a trade-mark, and thereby secure the monopoly of a medicinal substance for all time, is fundamentally wrong.

The speaker thought that were those matters represented to Congress in the proper manner the laws would be modified in the near future, although, no doubt, any effort in that direction would be stubbornly opposed. The alcohol question was still an open one. In place of the resolution passed at the annual meeting in 1894, he would submit the following modification:

Resolved, That it is the sense of this Association that the payment of the rebate of the internal revenue tax on alcohol should be confined to alcohol used in the manufacture of chemicals, alkaloids, ethers, chloral, chloroform, and such other medicinal or industrial products as those in which the alcohol used will lose, absolutely, its chemical and physical properties.

Mention was made of the International Exposition at Prague, which was opened on August 15th, and that the Association would be represented there by Dr. F. Hoffmann, who is now in Europe. The President proposed that greetings be sent the gathering by the Association.

The speaker having concluded, Vice-President Dohme asked the pleasure of the meeting regarding the address. It was voted to receive it and refer it to a committee of three, to be appointed by the chair. Messrs. Diehl, Butler and Simpson were made this Committee. Secretary Charles Caspari, Jr., then called for the reports of the various standing and special committees.

The selection of the nominating committee to elect the officers for the ensuing year was the next business in order, and to afford the members from the various States and Provinces an opportunity to choose their representatives, the President granted a recess of five minutes. The meeting was subsequently called to order, and the Permanent Secretary asked to call the roll of States, Territories, District of Columbia and Provinces of Canada. Responses were had from Arkansas, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, District of Columbia, and the Provinces of Ontario, Quebec and Nova Scotia. In addition to those representing the States and other sections, the President appointed at large Messrs. Ebert, Remington, Gray, Betzler and Voss as members of the Nominating Committee. The committee decided to meet immediately after the adjournment of the session.

Secretary of Council Kennedy followed with the minutes of that body, which had held its first session at 10 o'clock A.M. The minutes were adopted. Mr. Kennedy also reported at this session the names of sixty-two applicants for membership. They were mainly from the eastern and northeastern sections of the United States, although several were from Canada.

The Permanent Secretary was ordered to subscribe for foreign and domestic journals for the use of the Reporter on the Progress of Pharmacy. The reports of the Committee on Membership, of the Auditing Committee, and of the Treasurer for the past year were then listened to.

Professor Whelpley proposed that the Publication Committee on National Formulary allow text-books and periodicals to publish the National Formulary. This proposition was referred to that committee.

A Committee on Time and Place of next Meeting, consisting of Messrs. Alpers, Sheppard, Frost, Fennel and Burge, was appointed by President Good. The committee met after the adjournment of the Nominating Committee. Invitations from Nashville, Tenn., and Lake Minnetonka, Minn., were referred to it. Vice-President Dohme invited the Association to Baltimore, Md., in 1898. Some proposed amendments to the Constitution and By-laws offered at the meeting last year were adopted. Among these was the change of the name of *Permanent* Secretary to that of *General* Secretary. Inquiry was made by Professor Hallberg as to the matter of the International Pharmaceutical Congress organized at the meeting in Chicago in 1893. Professor Whelpley offered an amendment to limit the reading of papers to ten minutes, or in case of a long paper, it must be accompanied by a synopsis, which should not take more than ten minutes. It was referred to Council. Some greetings of personal character and invitations were extended by members present on behalf of friends. Secretary Caspari then made some announcements regarding transportation, and at 6.30 P.M. the session adjourned until 10 A.M. on the following morning. On Wednesday evening, at 9 o'clock, the members of the Association were tendered a reception by the Pharmaceutical Association of the Province of Quebec and the Montreal College of Pharmacy, in the parlors of the Windsor Hotel. The guests were received by the Presidents of these organizations, Messrs. R. W. Williams and W. H. Chapman, respectively. The events of the evening were much enjoyed by all in attendance.

SECOND GENERAL SESSION.

The session began business at 10.40 A.M., Thursday, August 13th, with President Good in the chair. Secretary Caspari read the minutes of the first general session. They were approved. Secretary Whelpley, of the Nominating Committee, reported the following as the choice of the committee for the officers of the Association for the ensuing year: President, J. E. Morrison, Montreal, Can.; First Vice-President, G. F. Payne, Atlanta, Ga.; Second Vice-President, W. A. Frost, St. Paul, Minn.; Third Vice-President, G. W. Parisen, Perth Amboy, N. J.; Treasurer, S. A. D. Sheppard, Boston, Mass.; General Secretary, Chas. Caspari, Jr., Baltimore, Md.; Reporter on Progress of Pharmacy, C. Lewis Diehl, Louisville, Ky.; Members of Council, for three years, C. E. Dohme, J. M. Good and J. P. Remington. It was moved that the nominee for President be balloted for. Messrs. Stevens and Hereth were appointed tellers. Mr. Morrison was unanimously elected. The General Secretary was then asked to cast an affirmative ballot for the other nominees. Minutes of Council were then read by Secretary Kennedy. They were approved. The applicants whose names had been read on the previous day were then invited to complete their membership by paying the annual dues and signing the Constitution. The Committee on Time and Place of next Meeting submitted two reports, one in favor of each place from which invitations had been received. The majority had decided on Lake Minnetonka, Minn., but Mr. J. O. Burge, who represented the minority, endeavored to have the Association consider Nashville, Tenn. Mr. Burge finally lost his motion, and as it had been decided to vote separately on the matters of place and time, an opportunity to discuss the merits of the seasons and days of the week was afforded the members. It was finally agreed that Monday, August 23, 1897, should be the date. The Treasurer then read his report, which Vice-President Dohme moved to receive, as it had been examined by the Auditing Committee. The same disposition was made of the General Secretary's financial accounts. The Reporter on the Progress of Pharmacy, Prof. C. Lewis Diehl, read the introductory to his report, which will occupy about 500 pages of the volume of Proceedings. The report was accepted. Secretary of Committee on Membership Kennedy then reported for the past year. The members who were elected at Denver last year represented thirty-seven States. Only one man became a life member during the fiscal year. Many members were in arrears, and 209 of these who had been delinquent for three or four years were likely to be dropped from the roll. There were 95 life members on the roll at the time of the report. The honorary membership was the same as last year, there having been one death and one member added. The resignations of 25 members had been received. Eighty-three had been dropped from roll for various causes. Death had claimed 19 members. The contributing members numbered 1,448, while the total membership aggregated 1,558. Mr. Kennedy said that, in submitting his twenty-second annual report, he desired to express his thanks to all the officers and members of the Association who so promptly responded when their assistance was required. The report was received and referred to the Publication Committee.

Mr. Ebert proposed a change in the Constitution, making it necessary for the annual fee of $5 for the current year to accompany the application for member-

ship. He was of the opinion that the Association had followed the "drag-net" policy long enough. Chairman C. E. Dohme, of the Finance Committee, reported for that body that expenses had increased during the past year, and that the income had not come up to expectations. Prof. Hallberg moved to receive and publish the report; also, in a second motion, to cheapen the Proceedings. These matters were referred to the Publication Committee.

The reports of the Committees on Publication and Investments were received, adopted and ordered to be published. The report of the Committee on the Revision of the Pharmacopœia was read by title and referred to the Scientific Section for consideration and discussion. Secretary Caspari then read the report of the Committee on General Prizes for papers presented at the last meeting in Denver. The first prize was awarded to Edward Kremers for his paper "On the Chemical Composition of the Volatile Oil from Monarda fistulosa; the second to Edson S. Bastin, for his contribution on "The Structure of Our Cherry Barks;" and the third to Mr. A. R. L. Dohme for his several papers on "Aconitine and Assays of Ergot, Pilocarpus, Coca Leaves and Ipecac Stems." The report was adopted. The Committee on Ebert Prize did not find any of the papers presented at the last meeting to meet the requirements, although they recognized the good quality of many of those submitted. Prof. Hallberg suggested the establishment of a beneficiary fund, and moved that a committee of three be appointed to consider the feasibility of adopting such measures. The motion was carried. The session then took a recess until 3 P.M., when President Good called it to order again. Secretary Caspari read the report of the delegates to the American Medical Association. The report was accepted, and as that body desired the American Pharmaceutical Association to continue to send delegates it was so ordered by the latter. It was moved that a committee be appointed to take up the suggestion of Prof. Rusby, for the consideration of joint investigation by the sections of materia medica, therapy and pharmacy of the two associations referred to above. It was amended to refer this suggestion to the Scientific Section for action. The amended motion was carried.

Chairman Whelpley read the report of the Special Auxiliary Committee on Membership. Mr. Ebert moved to receive it and thank the committee for their work, also to continue the committee and to thank the pharmaceutical press for their aid to the committee. The Committee on National Legislation, created in Denver at the last meeting, submitted a report through its chairman, F. E. Stewart, which document contained an exhaustive dissertation on the present patent and trade-mark laws of the United States, and concluded with the following recommendation:

"Your Committee would, therefore, suggest that a memorial be drawn up, stating the reasons why pharmacy should be afforded relief from the trade competition which threatens its very existence as a profession, and embodying our complaint in relation to the misconstruction of copyright and trade-mark laws, which are seriously injuring the science and practice of pharmacy, and sending the same to the United States Congress, to every pharmacal and medical society, to the American Public Health Association, and the National Bar Association. Then let us keep close watch of the courts, and throw our aid and influence on the side of the right in every case where the pharmacist is in the toils of the law—not to support infringements of patents, copyrights or

trade-marks, or imitations of labels and packages, but to insist that he shall have the unrestricted privilege of making and selling any unpatented pharmaceutical, and of dealing in it under the name by which it is known to the public, in just the same manner as those in the iron business have a right to make and sell iron, or those who manufacture silk or cotton fabric may do so under their proper names.

"We do not wish, however, to advocate a policy by which different things shall be put on the market under the same names. On the contrary, we would insist that the same things under the same names shall be free to all pharmacists to make and sell so long as they are careful not to infringe the just rights of others."

It was moved and carried to receive the report and refer it for publication; also to continue the committee. Secretary Caspari then announced that he had received credentials from four Alumni Associations, twenty-two colleges of pharmacy, thirty-eight State and local associations, representing almost every section of the United States. The report was received and the delegates invited to take the privilege of the floor. Professor Whelpley offered a change in the by-laws, which would direct the General Secretary instead of the President to read the roll of States for the information of nominators of officers. The session then adjourned until 10 A.M. on Friday.

SECTION ON COMMERCIAL INTERESTS.

Immediately after the adjournment of the second general session, Chairman Geo. J. Seabury, of the Section on Commercial Interests, called that body to order. He then read a letter from the Secretary of the Section, Clay W. Holmes, in which that gentleman stated that, on account of sickness, he would be unable to attend. Mr. J. O. Burge, whom Mr. Holmes had succeeded as Secretary, and who was absent from the Denver meeting for the same reason, was chosen Secretary *pro tem.* The reading of the minutes of the Denver meeting of the Section was dispensed with by vote. Chairman Seabury then read the replies he had received from five persons to the queries which he had sent in printed form to the members of the Association, and which were intended to form topics for papers to be read before the Section. His view of the alcohol question was the same as last year, when he recommended free alcohol for use in the manufacture of products to be exported. He recommended that a committee on professional relations between pharmacists and physicians be appointed. The suggestion was made, he said, for the benefit of the National Committee on Trade Interests.

The address was received and referred to a committee, who were to consider the recommendation.

Messrs. Mennen, Simpson, Thompson, Hallberg and Ryan were appointed by the Chairman as a committee to nominate the officers of the Section for the ensuing year. The Chair then declared a recess of five minutes, in order that the committee just created might transact its business. Mr. T. F. Main was chosen Chairman, but he asked to be excused. The following were afterwards nominated: Chairman, Lewis C. Hopp, Cleveland, O.; Secretary, J. E. D'Avignon, Windsor, Ontario; Associates, Messrs. Mennen, Patton and Dewoody. It was moved and carried that these gentlemen be elected, the meeting ordering the Secretary to cast an affirmative ballot. Mr. Seabury then

called for the reports of the Special Conference Committees and the National Committee on Trade Interests, both of which were appointed last year at the annual meeting, but their chairmen were absent and no reports were received. Secretary Burge read resolutions recommending organization of pharmacists. Mr. E. A. Robinson read a paper in reply to Chairman Seabury's query :

"Are non-secret preparations, in imitation of well-known domestic medicines, legitimate products ; and is it honest for a dealer to allow his name to be printed on the label so as to give an unknown compound currency, when he is ignorant of the contents of such preparation ? Why does he not prepare his own family and household remedies ?"

The paper was received and referred to the Publication Committee, but no further comment was elicited. Secretary Burge then read a communication from Secretary Holmes, in which the latter said a publication, entitled *The Mortar and Pestle*, had been undertaken by the officers of the Commercial Section, with a view of organizing the pharmacists for their mutual benefit. Four numbers were stated to have been issued ; the first issue was said to have been mailed to every druggist in every town having four druggists, or in all 20,000 copies. The subsequent issues were each in succession of a lesser number of copies, and the territory of their distribution narrowed until only the New England States and some of the largest cities of the Middle and Central States were supplied. A fifth number was about to be issued when the editor was taken sick. It was said to have been difficult to get sufficient matter for the publication, on which account its appearance had been irregular. Many of the members said they had never seen the paper. Others had received a number at each issue. Some had subscribed for it at $1 per year. The Editor, Clay W. Holmes, stated in his communication to the Section that he stood ready to refund all subscriptions pro rata to those who were dissatisfied. The total expense of the publication was $709. Subscription receipts to the extent of $212 had been received. The appropriation of $200 made last year, by the Association, was spent in the effort to organize the pharmacists of the country for their mutual benefit by this means. Chairman Seabury defrayed the remainder of the expense. This gentleman stated that *The Mortar and Pestle* will be continued, and that hereafter all members will receive it. Mr. Alpers moved that all mention of the American Pharmaceutical Association on the stationery of the publication in question be prohibited ; and it was so ordered. It was then moved and carried that all reference to the *Mortar and Pestle* be expunged from the minutes. Professor Hallberg moved that the Association approve of an organization to manufacture and sell medicines for popular use, stating that such a procedure was a logical plan whereby the pharmacist may obtain relief from the patent medicine monopoly. A rising vote laid the motion on the table. The meeting thanked the retiring officers for their services. The newly elected officers were not present, hence they could not be installed at the time. There being no further business of the Section whatever, and the reading of the minutes having been voted down, the only session of the Commercial Section adjourned until next year's meeting.

SECTION ON SCIENTIFIC INTERESTS.

The first session of this Section was held on Friday, August 14th. President Good held a preliminary session of the Association proper, which he convened

at 10 o'clock in the forenoon. The applicants whose names had been read by Secretary Kennedy at a previous session were declared elected. The Committee on President's Address reported. The measures of legislation referred to and proposed therein were approved and ordered to be pressed until favorable action is secured. The Committee recommended that the General Secretary cable greetings to the International Exposition in Prague, Austria. This gentleman afterwards read greetings from the Wisconsin Pharmaceutical Association. He also read a letter from the Superintendent of the Mechanics' Institute of Montreal, in which that officer extended the privileges of the Institute to the members of the Association during their stay in the city. Secretary Kennedy read the minutes of a Council meeting, which stated that the body had elected its officers for the coming year, with Mr. W. S. Thompson, of Washington, D. C., as Chairman: J. M. Good, St. Louis, Mo., Vice-Chairman; and G. W. Kennedy, Pottsville, Pa., Secretary; and that Prof. Whelpley's proposition to allow periodicals to use the National Formulary free of charge, provided they did not publish more than fifty formulas per month, was accepted. The names of twenty-six more applicants for membership were read. The session then adjourned. At 10.55 Prof. Sadtler called the Section on Scientific Interests to order. He then delivered his address, which was devoted to

SOME THOUGHTS ON THE POSITION OF THE PHARMACIST AMONG THE GREAT FAMILY OF SCIENTIFIC STUDENTS AND WORKERS.

He would not, he said, stop to answer the sneering question which is sometimes asked concerning the right of the pharmacist to call himself a scientific man. "That is his birthright, and if he traces back the early history of chemistry, botany, or even medicine in its primary meaning as the curative art, he will find that they were cradled and fostered in the pharmacist's shop. If the modern pharmacist occasionally sells his birthright for the pottage of commercial gain, it cannot take from the earnest and conscientious worker inherited claims to a broad and important field of scientific activity."

The speaker then briefly defined the field and its limits which is peculiarly allotted to the scientific pharmacist. The study of pharmacognosy he considered the especial field that should be cultivated by the pharmacist. Thereby we are able to see that it antedates the history of modern chemistry, and in the Iatro chemists of the seventeenth and eighteenth centuries we recognize the scientific pharmacists of those days.

"But," he said, "it is not only the natural sources of medicinally active principles that should occupy the scientific pharmacist's attention. The raw materials which yield food preparations, and those which are the basis of many large chemical industries, equally furnish subjects which may properly attract the working investigator of the pharmaceutical profession. Few of us realize how extensive this field is and what enormous quantities of unutilized materials yet remain calling for investigation."

The speaker then called attention to another field, namely, that of organic synthetic remedies, which belongs to the pharmacist, but which practically he has lost by his inability to work it. In consequence, we pay to German manufacturers from four to six prices for products which we should produce at home if our large manufacturers could see fit to put the same amount of expert

chemical workers into their laboratories that the manufacturers of Germany do.

The next subject to which the attention of the audience was called was that of the methods of study and research which the modern worker in scientific pharmacy should follow. The difference in the amount of scientific study demanded twenty-five or thirty years ago and at the present time was dwelt upon, and the reason for the increase was declared to be two-fold. "A wider range of studies must be covered, owing to the broader demands which modern society makes of her educated citizens, and the interdependence of the several branches of science constantly becoming greater. The field before the scientific student of pharmacy has broadened, the methods of study have become more diversified, and the resources and facilities of our schools have been correspondingly increased. If we are as interested in the advance of pharmacy as we claim to be, let us not fail to be equal to our opportunities."

"To this end, the action taken last year, at the suggestion of my predecessor in this chair, of forming a Committee of Research would seem to be eminently proper. It has not yet, however, been productive of very extensive results. Possibly if the Committee were made larger and more representative, including more of the centres of pharmaceutical research, it might be made to accomplish more. While I make no recommendations on this subject, it is a matter which could well occupy the attention of the Section at one of its sessions. By a free interchange of opinion we could learn how to best stimulate the activity of all interested in this most desirable work."

The address was received and referred for publication. The Chairman then called for reports of committees. The committee appointed at Asheville, 1894, and continued at Denver last year, to investigate the question of indicators in the titration of alkaloids, submitted its report through Chairman Kebler. The committee had secured the continued services of Professor Lloyd, of Cincinnati, the assistance of Professor Bennett, of Ames, Ia., and of Professor Base and Dr. Engelhardt, of Baltimore. Brazil wood, cochineal, hæmatoxylin, lacmoid, tropæolin OO, and iodo-eosin were investigated in this connection. Considerable difficulty was experienced in securing some of the indicators of a satisfactory quality. This was especially true of tropæolin OO and iodo-eosin. Of the former none was secured satisfactorily sensitive, in the Chairman's opinion, but another member of the committee considered one sample satisfactory. Only one sample of iodo-eosin was obtained. All of the materials to be operated on, including the indicators, were sent to each worker, Accompanying the materials were instructions in detail for the preparation of the solutions of the indicators, regarding the amount of each solution to be used per titration, for the standardization of the volumetric solutions of sulphuric and hydrochloric acids and potassium hydroxide, and for operating on samples of quinine, cinchonine, strychnine, brucine, morphine, atropine, fluid extract of coca leaves, and powdered nux vomica and coca leaves. For the fluid extract and powders the following methods were prescribed :

Fluid Extract of Coca Leaves.—Ten grammes of the fluid extract are diluted with 10 grammes of distilled water in a 250 c.c. flask, 25 grammes of chloroform and 75 grammes of ether added, the vessel securely stoppered and well agitated. Add 5 grammes of 10 per cent. ammonia water and agitate the mixture frequently during half an hour.

(*a*) When the mixture has completely separated, pour off 50 grammes of the chloroform-ether mixture into a flask or beaker, evaporate the solvent on the water-bath, add 10 c.c. of ether and evaporate again. Dissolve the varnish-like residue in 15 c.c. of alcohol with heat, add water to slight permanent turbidity, add indicator and slight excess of acid solution and retitrate with centinormal alkaline solution.

(*b*) When the mixture has separated entirely, pour off 50 grammes into a separatory funnel, treat at once with 20 c.c. of acidulated water; after thorough agitation and complete separation, remove the 20 c.c. of water into a second separatory funnel. Repeat the above operation twice more with 15 c.c. of acidulated water. The acidulated water in the second separatory funnel is rendered alkaline with ammonia water, the alkaloids removed successively with 20 c.c. and 15 c.c. of a mixture of 3 parts (by volume) of chloroform and 1 part of ether. Collect the chloroform-ether mixture in a tared flask and distil off the solvent. The varnish-like residue is twice treated with 8 c.c. of ether, evaporated on a water-bath, finally dried on a water-bath and weighed. The varnish-like residue is now dissolved in 15 c.c. of alcohol, with the aid of heat; then proceed as in *a* above.

For Powdered Nux Vomica and Coca Leaf.—Place 10 grammes of the dry drug into a 250 c.c. flask, add 25 grammes of chloroform and 75 grammes of ether, stopper flask securely, agitate well for several minutes, add 10 grammes of 10 per cent. ammonia water; agitate frequently and well during one hour. The suspended powder separates almost immediately, and the alkaloids are dissolved. On adding 10 grammes more of ammonia water and shaking well, the powder agglutinates into a lump, the liquid becomes clear after standing a few minutes, and can be poured off almost completely. Treat 50 grammes of the chloroform-ether mixture from the nux vomica according to processes *a* and *b*, the coca leaf according to process *b*.

The committee reported the following conclusions:

(1) Hæmatoxylin is the indicator par excellence for titrating alkaloids. Brazil wood and cochineal compare favorably with hæmatoxylin, but are not as reliable in some cases; nor do they appear to be quite as sensitive.

(2) Pure alkaloidal material can be titrated with satisfactory results, excepting the cinchona alkaloids. Such anomalous results were obtained with the cinchona alkaloids, that we are inclined to think that the nature of these alkaloids is not fully understood.

(3) The estimation of alkaloids by means of volumetric solutions can only be carried out in laboratories where daily determinations are made. If the operator is not constantly in touch with his end-reaction tints he will be unable to secure satisfactory results.

(4) The gravimetric results based on process *b* are quite satisfactory, and it is with this process that the average worker will obtain the most concordant results. While the volumetric process yields good results in the hands of extremely careful workers and under the most favorable conditions, yet we feel convinced from our work that the method has not been sufficiently evolved to recommend it for general use.

Respectfully submitted,

A. R. L. DOHME,

LYMAN F. KEBLER,

Chairman.

All of the operators did not adhere to the prescribed instructions, so that their results are not comparable with the results of the other members. Prof. Caspari, the third member of the Committee, discussed the difficulty of determining the end-reaction, and mentioned different efforts he had made in the work to carefully study the changes in color. He objected to the prescribed methods for standardization of the acid solutions, also to the use of alcohol in the titration of the alkaloids and alkaloidal residues. His views on this last-named objection will be found below, as he subsequently read a contribution embodying them. During the discussion which followed, the difficulty of detecting the presence of minute excess of alkali and acid, was mentioned. Prof. Lloyd spoke of a method used by Dr. Waldbott, of Cincinnati, for this purpose. It consisted in taking a small quantity of the liquid from the bulk by means of a capillary tube, and pressing the end of the tube against the test-paper, while the latter was allowed through capillarity to conduct the water away from the dissolved matter, thereby serving to concentrate the action at the point of contact, and make a perceptible change in the color of the paper. Referring to Brazil wood, Professor Rusby said there were at least two varieties in the market, but that, after much effort, he had not been able to trace them to their sources. Prof. Prescott reminded the Section of the difficulties experienced, until about fifteen years ago, in the titration of phosphoric acid, and stated that the anomalies in the estimation of the cinchona alkaloids volumetrically might still be overcome, as were the difficulties of that inorganic substance. Messrs. Hereth, Fennel and Payne also participated in the discussion, and Prof. Bartley moved that the committee be continued next year, as they were certainly ascertaining whether or not alkaloids could be estimated by volumetric methods. Chairman Eliel being absent, Prof. Bartley presented the report of the Committee on the Revision of the Pharmacopœia. It was referred to the next session for reading and discussion. Professor Prescott, as Chairman, reported for the Special Research Committee. The committee was granted authority over the expenditure of its appropriation. The work of the committee was presented at the following sessions. Besides these papers the committee had been engaged in outlining alkaloidal assay methods, to give the best uniform results in adjusting standards of strength for the active and poisonous drugs, in devising methods for the isolation of active principles, and in collecting bibliography, considerable of which had been called for during the year. Taraxacum, cascara sagrada, solanine, compounds of bismuth with organic bases and olive oil were prominent articles on the list of substances whose bibliography was being compiled. The Committee placed itself on record as not being responsible for the individual contributions of its members or associates. It was thought a distinctive function might be made for the committee by having it co-operate with the National Committee on the Revision of the United States Pharmacopœia in the investigation of one particular drug or matter of importance. The Committee recommended that subsequent committees be yearly elected for the same purposes, as it had existed. Professor Sadtler suggested that the Committee be made a part of the Section. The report was received and the recommendations approved and adopted.

There was considerable discussion regarding the manner and conditions under which the Committee should be continued. The question was finally referred to Messrs. Bartley, Prescott and Thompson for consideration, and

these gentlemen asked to report at the next session. A motion to have the committees of the Association receive financial aid for any help supplied the National Committee on Revision of the United States Pharmacopœia was lost. The Section then proceeded to nominate the officers for the coming year. Mr. Alpers, the Secretary of the Section, was proposed for Chairman. Prof. Sadtler was also put in nomination for a second term, but declined to have his name voted on. Profs. Coblentz and Scoville were named for the Secretaryship. The Section then adjourned until 8.15 P.M. At 3 P.M., the members left the Windsor Hotel for an electric car ride through the city, Outremont, Cote des Neiges, etc.

A second session was convened in the evening at 8.15. After Chairman Sadtler called the session to order, Secretary Alpers read the minutes of the first session, which were adopted as read. The session then proceeded to vote for the candidates for office nominated at the previous session. Mr. Alpers was unanimously elected Chairman. The session balloted for the gentlemen named for the office of secretary. Prof. Coblentz received the greater number of votes, hence was elected. His appointment was afterwards made unanimous. The first business of the session was the reading and discussion of the report of the Committee on the Revision of the Pharmacopœia. A considerable part of the report was composed of suggestions to substitute for essential oils artificially prepared substances, of which the oils in the main are composed, and the establishment of assay processes for certain oils. Very few of the members were in favor of the change to replace the natural oils in the Pharmacopœia with these artificial products, but an overwhelming majority of the members present was against this replacement; however, all agreed that methods of assay were desirable, and that variations in percentage content of important constituents should be decided upon and limited. This matter, as, indeed, most of the report, was referred to the Special Research Committee. A considerable and warm discussion followed the reading of the suggestion of the reporting Committee, to drop whiskey, brandy and the wines from the Pharmacopœia. Mr. Ebert claimed such an action would favor getting alcohol without a license, as no beverages would then be official. Much interest was elicited, and the matter was finally put in a motion to be voted on. The majority were for retaining these articles. There were a number of other articles mentioned in the report, but their consideration was referred either to the Special Research Committee or to the Section on Materia Medica and Pharmacy of the American Medical Association.

Prof. Bartley, Chairman of the committee appointed to consider the advisability of continuing the Special Research Committee, and of arranging for the election of its members, reported that it was deemed favorable to elect four members to serve on the committee in question, in connection with the Chairman of the Scientific Section and the same officer of the Committee on the Revision of the Pharmacopœia, both *ex-officio;* that two of the four be elected this year for two years, and the other two for one year, thus making the body perpetual. The report was received and adopted. The names of the following gentlemen were presented to the meeting for choice: Messrs. Prescott, Lloyd, Patch, Coblentz, Trimble, Dohme and Kremers. The two gentlemen receiving the highest numbers of votes were to be declared elected for two years, and the two receiving the next highest numbers were to serve for one year. Profs.

Prescott and Lloyd were chosen for the two-year term, and Profs. Coblentz and Kremers for one year. A paper on

THE CAFFEINE COMPOUND IN KOLA.

BY JAMES W. T. KNOX AND ALBERT B. PRESCOTT.

The history and literature of kola were first elaborated, then the results of an investigation of the fresh seed were given in detail. When a fresh kola seed is cut or bruised, a chemical change immediately takes place, as shown by the rapid change of color of the cut surface from pink or cream color to red-brown. On this account the authors sought a method of exhausting the seed without this change taking place. They found by dropping the slices of freshly cut kola into boiling water, or water at a temperature above 65°, that this result could be effected, but that alcohol at a temperature of 45° or higher was better.

For pharmaceutical purposes they found the best solvent for extracting kola to be alcohol of not less than 50 per cent. strength.

The authors next exhaustively considered the subject of kola assaying, and offered a process which they had found to yield uniform results.

In regard to the so-called glucoside of kola, or kolanin, they found the dilute acids to be unsuited to the purpose of recovering completely the alkaloids from their natural combination, so that lead hydroxide was tried, and a simple and effective process of liberating the caffeine devised. This reaction of kolanin with lead hydroxide, they considered, indicated a tannin-like character for the body. "There is reason to think that the glucose obtained by decomposing this so-called glucoside with mineral acids exists primarily in combination with the tannin-like body, for, after chloroform had removed all the caffeine from the mixture of alkaloids, treatment with water removed nothing further. The liberation of glucose, therefore, is not necessarily simultaneous with that of caffeine, nor in consequence of it. This was further shown by decomposing the lead salt formed by the red coloring matter, through treatment with hydrogen sulphide, and thereby recovering the colored body previously combined with the caffeine. This body so obtained gave all tannin reactions towards iron salts, alkaloids, gelatin, etc., and had a pronounced astringent taste, on treating it with dilute mineral acid, in the manner directed by text-books; very positive evidence of glucose was given, not only by its behavior with Fehling's solution, but with phenyl hydrazine as well. The foregoing facts would seem to indicate that the so-called glucoside is a combination of caffeine (and theobromine) with a glucoside tannin."

An "artificial kola-tannate of caffeine" was prepared by the following process:

An aqueous infusion of kola was poured into a 10 per cent. solution of caffeine acidulated with hydrochloric acid. The presence of acid was necessary to obtain an aqueous caffeine solution of sufficient concentration, and especially to avoid the re-solution of the tannate of caffeine which takes place in the neutral solutions in the presence of an excess of either tannin or caffeine. The precipitate, abundantly formed, was rapidly filtered at the pump, washed with cold water, and well drained. It was then dissolved in alcohol, and filtered to remove insoluble extraneous matter carried down in precipitation. The alcohol was then distilled off under reduced pressure until the solution had reached a

syrupy consistence, and the evaporation continued to dryness over sulphuric acid in a vacuum desiccator.

The product so obtained was found to have identical properties with the so-called kolanin.

The theobromine was estimated and found to be 1·51 per cent. of the total alkaloids present.

The tannin of the kola they separated as free tannin and combined tannin, the latter they considered as existing "in combination with the caffeine as the so-called glucoside," and was separated by treatment of the drug with lead hydroxide after the free tannin had been removed by 95 per cent. alcohol.

The following were the combustion results:

Duplicates.	Free Tannin.		Combined Tannin.	
	I.	II.	I.	II.
C	53·36	53·57	55·61	55·78
H	5·19	5·28	5·37	5·54
O	41·45	41·15	39·02	38·68

No discussion followed the summarizing of this paper by Professor Prescott, and the next paper read was on

TARAXACIN.

By L. E. Sayre.

Continuing the investigation recorded last year, the author has this time devoted his time exclusively to the study of the bitter principle, taraxacin. Fifty pounds of the drug were extracted with chloroform. The extract obtained from this solvent was digested in alcohol, the liquid decanted, evaporated to a small bulk and poured into an equal volume of water. This watery solution, after removal of alcohol by evaporation and from additional resin by decantation, contained the bitter principle. All proteid matter was removed by alternate treatment with alcohol and water and filtration. The bitter principle was capable of extraction from aqueous solution by agitation with immiscible solvents, like chloroform and ether, but they deposited it as a gummy mass. It was found that this gummy residue would yield crystals when treated with hydrogen peroxide, and a quantity of this oxidation product was obtained, which the author designated *taraxacic acid.* Quite a quantity of this acid was prepared by heating the impure bitter substance on a water-bath for some hours with dilute nitric acid, precipitating with lead acetate, removing lead with hydrogen sulphide. The filtrate from the lead sulphide was evaporated and the taraxacic acid crystallized out. This compound had an acid taste, but no bitterness, and was, therefore, considered distinct from the bitter principle; the latter, Professor Sayre thought, had more the nature of an aldehyde. He thought the practical results of this paper might be the discovery of a means of assaying taraxacum root, by converting the bitter principle into taraxacic acid, converting this into a lead salt and weighing it as such. "But, to my disappointment, on further studying this acid, by observing its crystalline form,

solubility in different solvents, by its behavior when heated to determine its melting-point, by sublimation, etc.—to my disappointment this crystalline substance was thus identified as oxalic acid, the oxidation product of so many organic compounds." A complete bibliography of taraxacum accompanied the paper.

After the reading of this paper the session took a recess until Saturday morning, when, at 9.35 o'clock, Professor Sadtler again called for order. The first paper read was on

POISONOUS HONEY.

By Lyman F. Kebler.

Poisonous honey has been known since the time of Cyrus, 500 B.C., as chronicled by Xenophon, and has been frequently reported since. The immediate reason for the present communication was a case of poisoning, near Princeton, N. J. The author had the opportunity of examining some of the honey, and separated a poison from it, as demonstrated on two cats. He was inclined to ascribe the poisonous property of this sample to andromedotoxin. It has been claimed by some writers that it is impossible to distinguish the poisonous article, although the early travellers in North America usually avoided that which had a dark color. A lengthy and valuable bibliography accompanied the paper. In the discussion that followed, Prof. Rusby said he thought it quite impossible that such poisons should find their way to the nectaries of the flowers and then to the honey. Mr. Alpers inquired what effect these poisons would have on the bees. Prof. Rusby replied none, as the nervous organization of the bee is such as to be unaffected by these substances.

The second session of the Scientific Section was then adjourned. Immediately after this adjournment, President Good called a short general session to listen to the minutes of Council. Edward Shumpik, of Minneapolis, Minn., was selected by Council to serve as Local Secretary at the next meeting, which is to be held in 1897 at Lake Minnetonka. There being no further business, this session adjourned.

The third and last session of the Scientific Section was then begun, with Prof. Sadtler as presiding officer. The reading of the minutes of the second session was dispensed with, upon motion. A paper was then read on

CANADIAN POTASHES,

By T. B. Reed,

in which, in addition to other valuable information, he stated that the output in 1895 amounted to 1,500,000 pounds.

GELATIN CAPSULES,

By W. C. Alpers,

was the subject of the next paper; this paper is printed in full in this number. The author showed a model of his device, and practically illustrated its working. A paper was then read on

SOME RESULTS OBTAINED IN THE DESTRUCTIVE DISTILLATION OF LINSEED OIL, WITH REMARKS ON ITS BEARING ON ENGLER'S THEORY OF THE ORIGIN OF PETROLEUM.

By Samuel P. Sadtler.

This paper is also published in the present issue. He exhibited a sample of the original oil and samples of the fractions obtained during the distillation.

The highest of these fractions separated scale paraffin on standing. A residuum was left after the distillation, which was similar to that obtained in petroleum distillation.

Prof. Lloyd referred to some legal proceeding against parties in Ohio for alleged adulteration of linseed oil with paraffin oils. He said he hoped this matter would be brought to their notice. Messrs. Fennel, Remington, Caspari and Payne also spoke of the significance of this valuable contribution to the knowledge of fixed oils. The next paper was entitled

MIXTURES OF SOLIDS FOR INTERNAL USE.

By C. S. Hallberg.

He reviewed the various forms into which solids have been put for internal administration, such as powders, pills, uncoated and coated, finally coming to compressed goods, such as tablets and tablet triturates. He objected to these on the ground of insolubility in many cases, and for the reason that the skill of the pharmacist had not been applied in preparing them. He was in favor of powders compounded on physicians' prescriptions, and stated that he believed the business of the retail pharmacist would be improved thereby. He concluded with a list of the kinds of medicinal agents that he believed should be administered in no other form than that of powder if given in the solid condition. A paper previously referred to in this report as having a bearing on indicators was next presented on

ALCOHOL AS A SOURCE OF ERROR IN THE TITRATION OF ALKALOIDS AND ALKALOIDAL RESIDUES.

By Charles Caspari, Jr.

The paper arose through some discrepancies which were noticed in the work of the author as one of the members of the Committee on Indicators. To test his belief that the trouble came through the use of alcohol, the author made a series of experiments in which he used water, alcohol and diluted alcohols of various strengths, both separately and in combination with alkaloidal materials. The author stated that alcohol appeared to play the part of an acid toward all of the indicators examined by the committee except tropæolin OO ; in the use of this it seemed to act as an alkali. The author stated the conclusions forced upon him as a result of the observations above enumerated are, that far more accurate volumetric determinations of alkaloids and alkaloidal residues can be made in water alone than in mixtures of the same with alcohol, and that the error caused by the latter is augmented as the proportion of alcohol is increased.

Professor Bartley inquired of the author whether the alcohol had been purified, as it might have been acid through oxidation. Professor Caspari replied that it had not, but that the two brands used were both free from acid, in fact, were neutral to litmus. Mr. Kebler said litmus was not sufficiently delicate for determining the presence of alkali or acid in such cases.

Professor Prescott suggested that the formation of ethyl salts might have something to do with the difficulty. Professor Caspari replied that he did not believe the conditions favorable to the formation of such substances, and that the only explanation that can be offered for this peculiar behavior of alcohol is on the basis of Arrhenius' theory of electrolytic dissociation, as detailed in the

writings of Professor Ostwald. According to the latter authority, indicators also depend for their value entirely upon dissociation, and, although the various alcohols have a dissociating effect upon salts held in solution by them, it is less marked than in the case of water, and decreases with the increasing molecular weight of the alcohol. Professor Lloyd said he had recently returned two barrels of alcohol to the dealer, for the reason that acetic ether was present in considerable quantity.

Mr. Kebler stated that absolute alcohol, as purchased, is almost always alkaline, probably through small quantities of alkali carried over mechanically during distillation.

THE HISTORY OF RHAMNUS PURSHIANA.

By J. U. Lloyd.

This is printed in full on page 467 of this number. Professor Rusby believed that the bark upon which the reputation of the drug was based was from Rhamnus Californica, and that the bark of Rhamnus purshiana had been substituted shortly after the introduction to general medical use. He stated that Rhamnus Californica was a shrub, while Rhamnus purshiana is a tree. He thought the bark of either species might be admitted into the Pharmacopœia. The next paper was

STROPHANTHUS SEEDS.

By S. E. Jeliffe.

He discussed the reasons for believing that biological changes had taken place in the case of this drug, and that, from the small brown seed of Strophanthus hispidus, through the seed of Strophanthus gratus and Strophanthus asper, a regular gradation to the long green seed of Strophanthus Kombé exists.

In reply to a question by Professor Rusby as to whether there was any special feature that might be used to detect the drug in the form of powder, the author gave a negative answer.

THE MENTHOL GROUP,

By W. O. Richtmann and Edward Kremers,

was presented by the latter. This, the fourth communication on the same subject, was mostly confined to a fundamental study of the physical constants of menthene, its nitroso-chloride and several other derivatives, in order to examine certain statements regarding the melting-point of the nitroso-chloride, which appeared inconsistent, and to prevent the multiplication of similar incongruities. The investigation is being continued.

Professor Kremers also presented papers

ON THE CHEMICAL COMPOSITION OF OIL OF MONARDA FISTULOSA.

By E. J. Melzner and Edward Kremers.

ON THE CHEMICAL COMPOSITION OF OIL FROM MONARDA PUNCTATA.

By William R. Schumann and Edward Kremers.

These two contributions will be printed in full in this Journal.

PREPARATION OF BORNEOL FROM SYNTHETIC PINENE.

By John William Schempf.

After detailing the work of Bertram and others in this line of investigation, the author supplemented their results by an account of his own study of the action of Bertram's reagent (acetic acid and 50 per cent. sulphuric acid) on synthetic pinene. He succeeded in separating considerable quantities of borneol, one lot having a melting-point of 198° to 199°, and another melting at 195° to 197°. The product in both cases was optically inactive.

PRODUCTS OF THE UNITED STATES PHARMACOPŒIA.

By C. T. P. Fennel.

The author criticized many of the standards of the U. S. P., and suggested a number of changes. His paper was accompanied by the results of analysis.

VALUATION OF WILD CHERRY BARK.

By A. B. Stevens.

During the past year, as a continuation of a paper read at the Denver meeting, he had made comparative studies of several methods of estimating the amount of hydrocyanic acid obtainable from wild cherry bark. Having found that the addition of sodium chloride to the distillate before titration of it with silver nitrate, as proposed by Dr. Dohme, made no difference in the results, the author disproved of such addition. His results pointed to the fact that wild cherry bark decreases in strength when kept in stock. In accordance with his results, published on p. 482, of this Journal, for 1895, he found that the green bark yields the least hydrocyanic acid, the bark of the twigs more, and the bark of the trunk the greatest amount. Mr. H. K. Mulford then read an account of the preparation of "Antitoxin" for diphtheria.

WHAT IS THE NATURE OF THE MODERN DIETETICS USED IN MEDICINE AND PHARMACY?

By F. E. Stewart.

In his prefatory remarks the author stated that "several queries in relation to various individual food preparations have been answered by papers read before the Association during the past three or four years," and that "it is the purpose of this paper to set forth some general principles regarding the class of substances which, in the hands of physicians to-day, are truly remedial agents and perform this function." Secretary Alpers then read the following papers by title:

ANTITOXIN.

By Dr. C. T. McClintock.

SALOL.

By Dr. F. Hoffmann.

PEPSIN TESTING.

By C. C. Sherrard and J. L. Tegarden.

THE UNITED STATES PHARMACOPŒIA PEPSIN STANDARD.

By C. C. Sherrard.

A METHOD FOR THE DETERMINATION OF PHOSPHORIC ACID IN SOLUBLE FERRIC PHOSPHATE, U. S. P.

BY W. A. PUCKNER AND FRANK JULIAN.

The authors first called attention to the fact that, while there are numerous excellent processes for determining the iron in this preparation, no exact method for estimating the phosphoric acid in the compound is known, since the operation is complicated by the presence of both iron and citric acid. They first tried some of the methods of estimating phosphoric acid in the presence of iron, and gave preference to that of Neubauer (Inaug. Diss. Rostock, 1893). In estimating official iron phosphate they examined the methods of getting rid of the citric acid, and gave preference to that in which nitro-hydrochloric acid is used.

The following details were given: Weigh 1 to 1·5 grammes of iron phosphate into a Kjeldahl digestion flask, dissolve in 25 c.c. water, add 10 c.c. concentrated nitric acid and 3 c.c. strong hydrochloric acid, and boil until reduced to 5 or 10 c.c.; transfer to a beaker, washing the flask with about 25 c.c. of water, add 250 c.c. of molybdate solution and digest at 40° for four hours. Decant the clear liquid through a small filter and wash the precipitate, retaining as much as possible in the beaker, with several small portions of molybdate solution, until the filtrate remains clear after making alkaline with ammonia, and therefore, is free from iron. The phosphomolybdate of ammonia is now to be dissolved in 25 c.c. of 10 per cent. ammonia water. When solution has taken place, it is filtered through the same filter, and the beaker and filter washed with 75 c.c. of water. Now 25 c.c. magnesia mixture are added, at the rate of 50 to 100 drops per minute, and with constant stirring. After standing eight hours or over night, the precipitate is transferred to a Gooch filter, using portions of the filtrate for the purpose, and finally the precipitate is washed with 2·5 per cent. ammonia water until free from chlorides (25 c.c. are usually sufficient). The precipitate is dried thoroughly at 100° to 120°, then gradually heated to bright redness, and retained at this temperature for fifteen minutes, cooled and weighed.

All of the papers were referred to the Publication Committee. The officers for the ensuing year were installed, and a vote of thanks given the retiring officers. The minutes were read and approved, and adjournment ordered.

SECTION ON EDUCATION AND LEGISLATION.

The first session of the Section on Pharmaceutical Education and Legislation met at 3 o'clock on the afternoon of Saturday, August 15th. The Chairman, Prof. Hallberg, commenced the business of the session by appointing Messrs. Sheppard, Bartley and Heusted a committee on his address, in case the members should desire to refer it to such a body for consideration. The address dealt with the subjects of education, legislation, physicians' dispensing, etc., and contained certain recommendations which are hereafter mentioned as having been approved by the committee to which the address was referred.

The Secretary of the Section then handed in his report. He had collected statistics concerning registration of pharmacists and assistants during the past year. Many of the Boards were unable to report and many would not. After careful consideration of all the facts, the writer was of the opinion that a State

is as well off without a law as with one, unless the Board is supported by a live State Pharmaceutical Association. He also gave the number of graduates during the past year. He thought all licentiates should first be registered as assistants. The reports of the Committees on Scholarship and on Registration of Poisons followed. The nomination of officers for the following year was then taken up. Profs. Beal and Hallberg were named for Chairman, and the same gentlemen in reversed order were mentioned for the Secretaryship. The first paper read was

CONCERNING THE CHARACTER OF STATE BOARD OF PHARMACY EXAMINATIONS.

By Harry B. Mason.

The author stated that it was his purpose to declare, first, that nearly all of the examinations held by State Boards of Pharmacy are of such character that the "quiz-compend" student is the one most successful in passing them; second, that the "quiz-compend" student is not the competent pharmacist; and third, that, therefore, to perform the high duty expected of them, the examinations must be changed in character, until only the competent pharmacist will be successful. Concerning this necessary change in character, he offered some suggestions to obviate these objections: ask, first, the use of knowledge and of faculty, which does determine fitness; and second, instead of asking single facts, duplicate the exigencies of practice themselves (using, if you will, only those more ideal), for then only such knowledge will be required as is necessary to competent service. To this end, bring into prominence problems in percentage composition, in specific gravity, in alligation. Ask speculative questions of importance, as to what course would be followed in a given case. Duplicate ideal prescription-desk necessities. Ask few isolated facts, but demand their combination and use, as is necessary in practice, of which the Board should be representative.

To do this, only those questions should be asked which demand, not the use of an unaided memory, but of reasoning, creation and judgment, and the possession and use of assimilated knowledge.

But though the applicant successfully acquit himself along these lines, he has not yet proved his real competency. He may lack sufficient shop experience. Shop experience gives the student the true perspective of the field of knowledge. Surround him, therefore, with the necessary appurtenances of his art, and then subject him to the same demands that are made of him in the prosecution of his regular duties.

If an applicant is to be examined with intent to discover his real efficiency, neither of these divisions of this scheme of examination can be sacrificed.

A COMPARATIVE EXHIBIT OF PHARMACY BOARD EXAMINATIONS.

By C. S. Hallberg.

By communication, he had received nineteen replies from as many State Boards; they sent him one or more sets of their questions. He, with the officers of the Section, collated these into a tabular statement. The questions were divided into sections, as chemistry, pharmacy, etc., and then subdivided, so that a comparison could be made. While he favored oral examinations, the author believed they should only supplement the written ones.

SUGGESTIONS TO BOARDS OF PHARMACY IN CONDUCTING THEIR EXAMINATIONS.

BY H. M. WHELPLEY.

He denounced the "quiz-compend" fiend. This was followed by a second paper on

SAMPLE EXAMINATION FOR THE AVERAGE STATE BOARD OF PHARMACY.

BY H. M. WHELPLEY.

This was a printed list of specimen questions. The preceding papers were then taken up for discussion. Dr. T. B. Reed opened with a rather severe criticism of a number of the questions proposed by Prof. Whelpley in the last paper. Some of these he characterized as absurd, as it is not the province of a Board of Pharmacy to ask a student what books he has studied. Referring to Mr. Mason's paper, Prof. Remington said he was glad to hear a criticism from a student's standpoint. He was opposed to examiners rating on a purely numerical basis, as questions are not of equal value. Mr. Holzhauer concurred with Prof. Remington, and added that he was afraid (as a member of the New Jersey State Board for fifteen years) the questions were becoming too difficult, and that very few of the examiners could answer the questions correctly themselves. He thought a Board should consider the locality in which the candidate is situated, and that some of the questions of Dr. Whelpley—like those in microscopy and volumetric analysis—were entirely too difficult; that what a State Board should do is to determine whether the applicant is competent to conduct the drug business. Several members asked about the percentages of correct answers required by the Boards, and whether all of them had but one set of questions. They were informed that some Boards had two sets; also, that some Boards grant an assistant's certificate in case the applicant has failed to secure a registered pharmacist's license—provided, of course, he answered enough questions properly to entitle him to it. The discussion was at some length, and was also participated in by Messrs. Chapman, Alpers, Butler, Payne, Good, Mayo, Frost, Williams, Burge, Bartley and Mason. The session then adjourned until 8.30 P.M. The reading of the minutes of the first session was dispensed with. The officers were re-elected for another year. The committee on Chairman Hallberg's address then reported that they approved of his recommendation to submit the matter of preliminary education to the various State Associations for consideration, and report at the next meeting. They also approved of his recommendation to limit the use of the degree of Pharmaceutical Chemist to those who had graduated without having experience in drug stores, and of having the degree of Graduate in Pharmacy imply that its holder had served drug-store experience. They also approved of his belief that State laws should require all applicants to be examined. The report was received and adopted by the session. A resolution was then offered to the effect that an annual renewal of registration is desirable. The motion on this was carried unanimously. A paper was then read, entitled

A DUTY OF PHARMACISTS TO THEIR UNREGISTERED APPRENTICES.

BY H. M. WHELPLEY.

Chairman Hallberg presented

THE PEDAGOGICS OF PHARMACEUTICAL EDUCATION.

BY JOSEPH FEIL.

The next paper was entitled

TO WHAT EXTENT SHOULD A CANDIDATE FOR REGISTRATION IN PHARMACY BE REQUIRED TO BE FAMILIAR WITH THE SUBJECTS OF MICROSCOPY AND VOLUMETRIC ANALYSIS?

BY T. B. REED.

It was in answer to a query by the Section. The author said:

"As a man might be a safe man and a successful pharmacist without any practice in Volumetric Analysis or Microscopy, the best proof of which is that many of the prosperous, and even leading men, who are appointed to Boards, have no practical knowledge of these subjects, it seems to me that Volumetric Analysis and Microscopy need not be included in Board examinations for registration."

The matter was discussed by Messrs. Alpers, Stevens, Sheppard, Bartley, Thompson and Whelpley.

A COMPARATIVE EXHIBIT OF UNITED STATES PHARMACY LAWS.

BY J. H. BEAL.

This gentleman has been engaged for several years past in making a thorough study of pharmaceutical legislat on, and the members of the Section expressed themselves as appreciative of this fact.

SOME ODDITIES IN PHARMACY LAWS,

BY J. H. BEAL,

clearly showed the contradictory and irregular ways in which many of the State laws are framed. An answer to a query

CONCERNING THE SALE OF INTOXICATING LIQUORS BY DRUGGISTS.

BY H. M. WHITNEY.

Mr. Sheppard explained the state of affairs in this matter in Massachusetts. Mr. Ebert was of the opinion that if the spirituous liquors were dropped from the Pharmacopœia many druggists who deal largely in these would go out of business, the latter being thereby improved.

PRACTICE *VS.* THEORY.

BY S. P. WATSON.

CONCERNING UNIFORMITY OF PHARMACEUTICAL LEGISLATION.

BY J. H. BEAL.

He said:

The United States had forty-nine pharmacy laws, and, therefore, forty-nine kinds of experience. As a national pharmacy law is impossible under the present Constitution, Professor Beal offered a resolution that the President appoint a committee of three to enter into consultation with the State Boards of Pharmacy, the Committees on Pharmaceutical Legislation of the State Associations and the Colleges of Pharmacy of the United States and Canada, for the purpose of drafting the form of a model pharmaceutical law. This duty was afterwards referred by vote to the officers of the Section on Pharmaceutical Education and Legislation. Reprints of Professor Beal's papers were ordered to be made and sent to the State Associations and Boards, and to the pharmaceutical periodicals. A paper was then presented, entitled

PHARMACEUTICAL JURISPRUDENCE.

By Joseph Jacobs.

All of the papers were referred to the Publication Committee. The re-elected officers were installed for the coming year, and given a vote of thanks for the past year's services. The reading of the minutes was dispensed with, and the last session of the Section adjourned.

FINAL GENERAL SESSION.

President Good called the Association to order at 10.30 A.M., on Tuesday. Secretary Caspari read the minutes of the second General Session and of the short General Sessions held just before the conventions of the several Sections. The minutes were approved, as were also those of the third meeting of the Council, which were read by Secretary Kennedy of that body. Up to the time of this report the latter gentleman had read the names of 112 applicants for membership. Those who had not previously completed their membership were now extended the invitation to do so. Chairman Payne, of the Committee on the Status of Pharmacists in the United States Army and Navy, then submitted his report, which showed the thorough manner in which the committee had been endeavoring to secure for the naval apothecaries and hospital stewards the proper recognition of their required abilities. The report was exhaustive and dealt with the statistics of examinations. The Committee felt much encouraged at the present prospects and are confident of success. The aim is to have the positions made sufficiently attractive to draw the attention of competent pharmacists. The committee will try to bring their bill to a vote at the next session of Congress. The report of the committee was received, approved and referred for publication. It was considered by some members desirable to have the co-operation of the American Medical Association. The Association expressed itself as appreciative of the efficient services of Mr. Payne as Chairman of the Committee. Professor Ryan read his report as Chairman of the Committee on Metric Weights and Measures. He spoke of the friendly attitude of merchants and of the press in general toward the adoption of the Metric system. These committees were ordered to be continued as proposed by President Good in his address, and were instructed to proceed without necessarily consulting State associations. Secretary Caspari read the report of the Committee on Transportation. This body had been unable to secure a reduction of railroad fare for the members living west of the Rocky Mountains. In connection with this report an amendment to the by-laws was proposed, to the effect that the Local Secretary need not be the Chairman of the committee unless convenience sanctioned it. The committee appointed to consider the President's address approved of the measures recommended by him. It recommended that his suggestions regarding the revision of the United States Pharmacopœia be made a special topic for discussion at the next meeting, and that the same topic be referred to the various State associations. This committee also recommended that the Committee on National Legislation be not only continued, but enlarged from three to five members, and that one of these be from the Dominion of Canada, in order that the interest be made international, and all to be appointed by the incoming President. The report of the committee was adopted.

Regarding the admission of certain "synthetic remedies" into the Pharmacopœia, Mr. Sheppard offered a resolution to the effect that it was the sense of

the Association that Congress should enact laws, rules and regulations concerning matters of copyright and patents on medicinal products, to protect this country against the invasion of foreign countries, which annually take large sums of money from the United States for such articles. The resolution was adopted. Prof. Hallberg offered the suggestion that a committee of five be appointed to collect facts concerning the use of alcohol by pharmacists, and to advise the Senate Committee having the subject of tax-free alcohol under consideration. This was also ordered. Secretary Caspari read a communication from the Nebraska State Pharmaceutical Association, in which that organization extended greetings and an invitation to the American Pharmaceutical Association to meet in Omaha in 1898. Mr. Mayo then put in a plea for New York for 1898, and Mr. Dohme reminded the meeting that he had previously spoken for Baltimore for that year. These matters were then referred to the next committee on time and place of meeting. A motion to amend the by-laws so as to make it imperative for an applicant to pay his first annual fee on the date of his application was discussed for some time, and finally tabled.

Mr. Hopp then offered a resolution to the Association to permit the Chairman of the Section on Commercial Interests to convene that body at the end of the last general session of the next meeting, if, in his opinion, it is necessary. This was held over to be taken up at the first general session next year. It was ordered that requisition for stationery should hereafter be made to the General Secretary; also, that the badges and bars of the Association should be placed in the hands of the Local Secretary for sale. The Local Secretary for next year was elected Chairman of the Entertainment Committee. A vote of thanks was then tendered to all the people of Montreal, at whose hands the Association had met so much and generous hospitality. Mr. Chapman, of Montreal, replied to this courtesy. President-elect Morrison spoke of the state of the finances of the local committees, and showed that the arrangements for entertaining the visiting members had been successfully carried out.

President Good appointed Messrs. Hereth and Chapman to conduct the newly-elected officers to the chair, where they were officially installed by him. The retiring officers were given a rising vote of thanks. President Morrison then appointed Messrs. Stewart, Ebert, Thompson, Muir and Squibb, a Committee on National Legislation; Messrs. Eliel, Bartley, Stevens, Searby and A. R. L. Dohme, a Committee on the Revision of the Pharmacopœia; Messrs. Hereth, Payne and Chapman a Committee on General Prizes; also the Delegates to the American Medical Association and the National Wholesale Druggists' Association, the latter of which is to meet in Philadelphia on October 5th. The reading of the minutes of the session were dispensed with. Mr. Mayo proposed that a committee of five be appointed to consider the advisability and feasibility of having the meeting of 1900 on board of a steamer en route to Europe. This was approved. To extend the time of the present meeting as arranged by the Council, Professor Ryan made a motion that the Association adjourn until 9 o'clock on the morning of August 26, 1896, and it was so ordered.

In the morning and afternoon of Monday, August 17th, the members of the Association and their friends took a trip through the Lachine Canal, Lake St. Louis and Lachine Rapids; in the evening they attended a concert in the Windsor Hall.

THE AMERICAN
JOURNAL OF PHARMACY

OCTOBER, 1896.

CHEMICAL ANALYSIS OF THE CANADA THISTLE, CNICUS ARVENSIS.

BY HERMAN J. PIERCE, PH.G.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy. No. 157.

This member of the natural order Compositæ is indigenous to Europe, but has become naturalized in North America. Here the plant is a very troublesome pest, as it grows in fields and spreads both by seed and deep-running roots. Its use in medicine is similar to that of the blessed thistle, which is tonic in the form of a cold infusion; in hot infusion in large quantities it is a diaphoretic, and in larger quantities emetic. The roots have been used in domestic practice in some localities, in combination with other drugs, in the preparation of a root syrup which is said to be alterative in its action. The plants for this analysis were collected during the flowering season in July and August, 1895, in the vicinity of Troy, Pennsylvania. They were deprived of foreign matter and thoroughly dried without exposure to direct sunlight.

Preliminary tests were made for starch with potassium iodide iodine solution, and for tannins with gelatin and alum solution; both gave negative results. The moisture present amounted to 6·90 per cent. The ash was found to be 11·50 per cent.; it contained potassium, magnesium, calcium, aluminum, iron, chlorides, sulphates, phosphates, carbonates and silica.

A weighed portion of the dried plant in No. 40 powder was macerated with the several solvents which will be mentioned as having extracted certain principles.

Petroleum ether dissolved fat, wax, caoutchouc and volatile oil to the amount of 1·73 per cent.

Ether (U. S. P.) extracted 1·05 per cent. of the weight of the powder. Water was added to the extract and the solution filtered. The filtrate was acid to litmus paper. Potassium mercuric iodide and potassium tri-iodide solutions were separately added to portions of this filtrate, but no evidence of alkaloids was shown. Fehling's solution was not reduced either before or after boiling a portion of the filtrate with acid, thus showing the absence of glucosides in this extract. The acid substance will be given further notice in the course of this paper.

Absolute alcohol removed 2·31 per cent. of soluble matter from the material. Of this amount 1·05 per cent. was resin and chlorophyll. The remainder was soluble in water. A small amount of glucose was indicated by Fehling's solution, which was applied to a portion of this water solution. Potassium mercuric iodide and potassium tri-iodide solutions gave reactions for alkaloids with separate portions of the water solution. The substance giving these reactions was shaken out of the water solution, after making the latter alkaline, with ether and chloroform. This principle was also further investigated, as will be shown hereafter.

Distilled water dissolved 11·47 per cent. of organic matter, including 4·37 per cent. of mucilage, 2·97 per cent. of dextrin, and a trace of glucose. Alkaline water extracted 3·17 per cent. of pectin and albuminous matter, and other plant principles to the total amount of 10·68 per cent.

Acidulated water removed 7·94 per cent. of organic solids from the residue, after the treatment with the alkaline water.

Treatment with chlorine water revealed 5·08 per cent. of lignin. The residue from this process contained 39·94 per cent. of cellulose. The material not accounted for by the foregoing figures consisted of 1·40 per cent. loss during analysis.

Experiments were made on a larger quantity of material in order to further investigate the acid and alkaloidal substances indicated by the proximate analysis. To make these experiments, about 450 grammes of the ground plant were exhausted by percolation with official alcohol. Nearly all of the menstruum was recovered by distillation, and the extract treated with about five times its volume of distilled water acidified with hydrochloric acid. The mixture

was poured upon a filter, the filtrate transferred to a separatory funnel and shaken with several successive portions of ether, and then with chloroform. The solution was then made alkaline with sodium hydrate, and again treated with chloroform and ether. The four portions of these solvents which had thus been applied to the watery liquid were first heated to recover the greater part of them, and afterwards allowed to evaporate spontaneously. Each of the residues so obtained was treated with a small quantity of warm absolute alcohol. These solutions were filtered and the alcohol evaporated. The residue that represented the substances removed from the aqueous liquid, while acid, by agitation with ether, was crystalline, while the one obtained with chloroform was of a syrupy consistence. These residues were treated with distilled water, which almost entirely dissolved them. The following reagents were applied to the filtered solutions—both of which gave the same reactions :

Blue litmus paper, reddened.
Silver nitrate, reduced.
Gold chloride, reduced.
Barium chloride, no change.
Lead acetate, precipitate.
Lime water, no change.
Ferric chloride, dark blue color.
Ferric alum, dark blue color.
Potassium bichromate, dark red color.
Fehling's solution, before treatment with acid, slight reduction.
Fehling's solution, after treatment with acid, no increase.

These results indicate the presence of an organic acid.

The material removed from the alkaline aqueous liquid by agitating it with ether was crystalline and had a narcotic odor. The corresponding substance obtained from this solution by the use of chloroform was a dark-colored thick liquid, possessing a narcotic odor. These products were then dissolved in acidified water. To separate portions of each of these solutions, Mayer's reagent, tannic acid, potassium tri-iodide, gold chloride, picric acid, platinic chloride and phosphotungstic acid were added, all of which indicated the presence of an alkaloid. These experiments were repeated with the same results on 2 kilos of the powdered plant. A small portion of the residue, instead of being tested with the foregoing reagents, was added to some soda-lime contained in a test tube.

Heat was then applied, and a strip of moistened red litmus paper, held in the mouth of the tube, was colored blue, indicating the presence of nitrogen in the substance. Another portion was added to some potassium hydrate solution in a test tube. A strip of moistened red litmus paper, held at the mouth of the tube, was colored blue when heat was applied to the tube. This behavior indicated that the substance was a volatile alkaloid.

The results of this analysis show that there is a volatile alkaloidal principle in the Canada thistle, which is very difficult to obtain in a crystalline condition, has a narcotic odor, and is soluble in ether, chloroform and alcohol. There are also present an organic acid, resin, chlorophyll, mucilage, dextrin, pectin, albuminous matter and small amounts of glucose, fat, wax, caoutchouc and volatile oil. Starch, tannins and glucosides are absent.

A RÉSUMÉ OF RECURRENT TOPICS.

By William B. Thompson.

Beeswax.—In pharmaceutical sessions the mere mention of this substance seems to provoke something of the facetious. The appellation of "Old Beeswax" implies that type of individual whose ideas are Bourbonic, fixed and established, unalterable. Not a bad simile either, if you reflect on it. Yet, the literature of pharmacy would seem to flatly contradict this comparison, for there is scarcely a substance playing a part in therapeutical application which seems to have so sorely puzzled the analyst as this homely product. Art is now so mischievously busy in supplementing the operations of nature, by trick, that it is really difficult to find a strictly pure article of beeswax in open commerce. It is yet a drug to the pharmaceutical understanding, however, and should be guarded, if possible, because it not only possesses properties peculiar to itself, and valuable, but also for the more general reason that if the future legislation, which we so much desire, should ultimately recognize the office and the prerogative of the pharmacist, lines will have to be more strictly drawn between the true and the false. Commercial practice may be permitted to adopt anything in the semblance and call it "wax." Sold as wax, however, will not constitute it *bees*wax. We should ever be careful in giving a tacit assent to a fictitious addition or substitution ; in fact, we should only use such knowledge to impel

us to an endeavor to suppress the practice. The writer believes it is generally known that the beehive of the present day is quite as much a piece of human as of insect industry, for the foundation of the comb or cell is ingeniously made of paraffin. Yet we affect a surprise when we are confronted with a sample of 16 to 1. It is absolutely futile to pose here under a plea of virtuous intent to provide more of those "shining hours" to that indefatigable laborer for the fabrication of our honey. There must be an unerrring means of determining the purity of this substance (beeswax) when met with in the course of commercial pilgrimage, but the modern article is so adroitly compounded as to successfully elude ordinary scrutiny. The exact temperature point of congelation or solidification after fusion offers a good guide. In the instance of beeswax, particularly, it is hard for the rogues to imitate this. It is said that between specimens of pure unbleached and bleached wax this degree varies considerably.

Alcohol.—A summary of expert medico-legal testimony on the subject of the physiological effects of alcohol on the human organism concludes that 15 grains to every 2 pounds avoirdupois of weight during twenty-four hours is not incompatible with and appears to favor health. Thirty grains, however, under the same conditions as to weight and interval, will produce intoxication, whilst 120 grains will cause death in from twenty-four to thirty-six hours.

Investigation and Research.—A review of the results along these lines for the last thirty years ought to prove very encouraging to the student of pharmacy. Very many of the valuable agents which have been brought to knowledge and into use had no existence previously, except as curiosities of the cabinet. It is always a subject of national regret that American chemists and pharmacists do not figure more considerably in these discoveries and inventions. It may be, perhaps, that we have not imbibed the spirit or that degree of patience which characterizes the votaries of science in other lands. The history of the antipyretics discloses a fact, namely: that in the pursuit of a definite purpose one may accidentally stumble upon a useful product hitherto unknown. It is not contended that discovery is always the result of design. On the contrary, how many of the most important and enduring contributions to scientific knowledge in its application to life and health have been the result

of chance, as it were. Soon we shall be highly entertained by an account of the proceedings of the medical celebration, in Boston, of the semi-centenary of the use of ether as an anæsthetic. This was but fifty years ago, and when the personal connection of Jackson and Morton with that event is again recounted, it will be seen how purely casual it was. Who thought of boric acid, except as a chemical oddity, prior to 1870? This constituent of borax is now marketed by the ton.

The Vacuum Pan.—From a comparison of products it might reasonably be inferred that many operators use the apparatus for a partial purpose only, whereas the intention of its construction contemplates that a product should be reduced from a liquid to a solid state—even to a dry solid—with as complete an exclusion of atmospheric exposure and pressure as possible throughout the whole operation. The features are a rapid reduction of bulk below 120°, the recovery of alcohol, and a chemically unchanged substance. With all these paramount and manifest advantages, particularly in the preparation of solid extracts of vegetable drugs, it required many years to convince of its great utility. Even as high an authority as Dr. Redwood is quoted as having given but an indifferent approval of it, and that as late as 1840. It is quite likely that the Professor did not see the best practical results and was misled in that. It is stated that when first introduced, extracts prepared *in vacuo* (so-called) were pronounced a failure because they could not be kept in the necessary physical condition. We now make a closer study of the chemical composition of drugs than prevailed at the former day, consequently we get better products, and there is yet much to be learned in this fertile direction—a hint to the pharmacist now.

PHILADELPHIA, September 7, 1896.

For some years inventors have been trying to transport fruit in cars filled with carbonic acid gas. Inasmuch as the germs of fermentation cannot live in this gas, it is assumed that no ice would be needed, and, since this is both heavy and expensive, it is thought that fruit can be transported for long distances much more cheaply in the new way. A carload of fruit, in one of these gas cars, was lately sent from San José, Cal., to Chicago, but the result was not satisfactory. It is reported in the local papers that the fruit had not rotted, but owing to the extreme hot weather it had almost been cooked. Ice will still be a necessity in very hot weather, unless some means of keeping the car cool is added to the antiseptic advantages of the gas.—*Garden and Forest.*

SOME RESULTS OBTAINED WITH LLOYD'S ALKALOIDAL STANDARDIZING METHOD FOR FLUID EXTRACTS.

(Abstracts from Theses.)

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy. No. 158.

The following outline of the method proposed by Prof. J. U. Lloyd for standardizing some fluid extracts which contain alkaloids, is taken from the *Proceedings* of the American Pharmaceutical Association, p. 128, 1891, where it is given as a scheme to assay fluid extract of guarana: "In a flat-bottomed mortar, with a good lip, mix 5 c.c. of the fluid extract with 2 c.c. of official solution of ferric chloride. Add sodium bicarbonate with constant trituration, until a stiff magma results. Abstract the magma by repeated triturations with chloroform, using first 20 c.c. and then three portions of 10 c.c. each, decanting them severally. (This excludes tannates, gums, albuminates, mineral salts, most vegetable acids and salts, and most coloring matters. The chloroform extracts the caffeine and an insignificant amount of coloring matter.) Mix the chloroformic solutions, evaporate in a tared dish and weigh the residue. The caffeine will be but little colored, and will be crystalline."

The process has been applied to the fluid extracts, and, in some of the cases, to other forms of the following caffeine-yielding drugs:

Tea.—William L. Mountaine, Ph.G., assayed six samples of fluid extract of tea. He found the same results by using three portions of 10 c.c. each of chloroform as when following the prescribed quantity. The percentages are based on the assumption that a c.c. equals a gramme of the drug:

Assays.	Samples.					
	1.	2.	3.	4.	5.	6.
a	1·00	1·25	1·40	1·30	0·80	1·00
b	1·05	1·22	1·45	1·32	0·80	0·98
c	1·08	1·25	1·45	1·30	0·80	1·00
d	1·06	1·24	1·43	1·31	—	—

Coffee.—William E. Weiss, Ph.G., obtained concordant results when he applied the method to fluid extract of coffee in duplicate assays. The percentages of caffeine shown by eleven samples of this preparation, said to have been made from the green berries, were as follows: 0·74, 0·82, 0.74, 0·88, 0·46, 0·54, 0·54, 0·14, 0·30, 0·28 and 0·14; two samples, which had been made from roasted berries and intended for making syrup, contained 0·38 and 0·27 per cent. of the alkaloid. These results also indicate the poor quality of the product on the market.

Guarana.—Edythe Weston, Ph.G., found, upon assaying eight brands of fluid extract of guarana from the market, that the preparation usually yielded from 2·62 per cent. to 3·50 per cent. of caffeine, although an exceptional case showed 5·97 per cent. The exact percentages were as follows for the duplicate assays:

1.	2.	3.	4.	5.	6.	7.	8.
2·60	2·88	3·00	3·20	3·34	3·34	3·44	5·96
2·64	2·94	3·46	3·40	3·42	3·48	3·56	5·98

The firm that supplied sample No. 1 claimed it to be a standardized preparation, containing 4·50 per cent. of caffeine, or that 100 c.c. would yield 4·5 grammes of this alkaloid. They also recommended that Professor Lloyd's method of assay be tried as a means of estimating the caffeine. Five trials were made by this method, but the figures given in the table could not be exceeded. A sample of the powder from which this fluid extract was made was submitted to the same treatment as in the assay of the preparation. The residue from the evaporation of the chloroformic solution contained a fatty substance; this was separated by treating with acidulated water, and its weight was then deducted from the first constant weight. By this means 2·72 and 2·98 per cent. of caffeine were found. From these results it might be concluded that this method of assay is also applicable to the powdered drug. The fatty substance was not encountered in working with the fluid extracts. In both of the assays made of Nos. 3 and 8, the magmas when treated with chloroform yielded dark-colored solutions through small quantities of iron, which were dissolved. An ash determina-

tion was made in each of these cases, and the weight of the non-volatile matter deducted from the constant weight of the contaminated caffeine.

Kola.—Otis O. Schaeffer, Ph.G., applied the process to fluid extracts and wines of kola, also to a cordial and an elixir of it. In the cases of the fluid extracts 5 c.c. were taken for the assay; of the other preparations 20 c.c. were used. The fluid extracts showed 1·41, 1·35 and 0·80 per cent. of alkaloid; the cordial and elixir yielded 0·30 and 0·24 per cent., respectively. Much variation was found in the wines from which 0·11, 0·72, 0·85 and 0·27 per cent. were severally obtained.

THE EFFECT OF PHOSPHATIC MANURES ON THE GROWTH OF JALAP TUBERS.[1]

By David Hooper.

For many years past the jalap plant (*Ipomœa purga*) has been successfully cultivated in the Government cinchona plantations at Dodabetta, Nilgiris, and quantities of the dried tubers have been supplied annually to the Madras Medical Store Department. The valuable qualities of the tubers grown on these hills have been noticed on various occasions since they were introduced in the year 1870. Some of the first samples of the drug analyzed in England yielded 18 per cent. of resin, and samples of the mixed powder from consignments sent to the medical stores have contained from 16 to 17 per cent. of the active principle.

About two years ago it was noticed that the plants were not in their usually healthy condition; they did not flower so freely, and the tubers were slightly discolored and of smaller size. It was supposed that the land in which the crop had been grown year after year was becoming exhausted, and the plants were not assimilating sufficient nourishment, and this supposition was borne out by the fact that the tubers from this plot contained only 12·9 per cent. of resin. Some of these tubers were transferred to some freshly-manured soil, and, after a few months' growth in their new surroundings, the tubers were examined and found to contain 15·3 per cent. of jalap resin. In another experiment, a fine, large tuber, which

---

[1] *Pharmaceutical Journal*, July 11, 1896.

had been growing in the neighborhood of a manure heap, afforded as much as 22 per cent. of resin, which may be considered the largest yield on record.

The question of manuring is one of great importance in cultivating drugs for the purpose of increasing their active principles. It has been proved over and over again in cinchona culture that nitrogenous and phosphatic manures increase the amount of alkaloids in the bark; on the same principle potash is good for tobacco crops, and magnesia and lime cause a development of sugar in the sugar cane. There is no doubt that better results would be obtained in growing medicinal plants if attention were directed to a proper system of applying suitable fertilizing agents to the crops.

With regard to the Nilgiris, it is known that there is a deficiency of lime and phosphoric acid in the soil, and an addition of these two ingredients has always proved beneficial to the local tea, coffee and cinchona estates.

For the purpose of observing the action of these substances on the growth of jalap tubers, and the effect they would have of increasing the active principle, an experiment was made in which some powdered mineral phosphate and superphosphate were employed. Into one box was placed some ordinary soil of poor quality; in the second the soil was mixed with some mineral phosphate in the proportion of 16 cwt. an acre, and in the third the soil was mixed with superphosphate in the same proportion. In each of these boxes was planted a small jalap tuber, and the boxes were left undisturbed for nine months. The plant that grew from the tuber in the third box was much taller than that in the second, and the plant in the second was finer than that in the first. The subterranean portion of the plants corresponded with the aërial growth, for when they were taken up the tubers were found to have developed remarkably in the manured soil.

The respective weights were as follows:

	Fresh.	Dry.	Per Cent. of Water.
No. 1, Unmanured	32	7·62	76·2
" 2, Phosphate	85	22·44	74·2
" 3,	228	54·20	76·2

The percentage of resin was then estimated in the dry powder with the following results; the amount of ash was also taken in each sample:

	Resin.	Ash.
No. 1	10·49	4·95
" 2	11·97	4·38
" 3	13·79	4·30

Considering that the tubers were taken up before they were fully grown, and before they were of the size usually seen in commercial circles, the result of the application of phosphatic manure was most satisfactory, not only increasing the weight of the tubers, but also increasing their value in the amount of active principle.

ON THE CHEMICAL COMPOSITION OF THE OIL OF MONARDA FISTULOSA, L.[1]

By E. J. Melzner and Edward Kremers.

Introduction.—A year ago a specimen of oil of wild bergamot was examined in this laboratory. It was found to contain about 50 per cent. of carvacrol. From the non-phenol constituents there were obtained cymene and an oxygenated fraction of a very high boiling point. Furthermore, there was isolated a crystalline coloring matter resembling alizarin. The commercial importance of the discovery of so large a quantity of carvacrol in so common a plant, is alluded to in one of the closing paragraphs. A question of physiological interest is also alluded to in the following words:

" If the oils examined by previous investigators had been positively derived from Monarda punctata, one might be inclined to suppose that the two species *punctata* and *fistulosa*[2] produced two isomeric, yet chemically distinct, phenols, viz.: thymol and carvacrol. Under the conditions such a conclusion would be unwarranted at present—this all the more so if one recalls the observations made in the laboratories of Schimmel & Co., that, *e. g.*, oil of thyme sometimes contains thymol, sometimes carvacrol, or both. This question of plant-physiological interest can, therefore, be answered only after a longer and more careful study of the oils of both species of Monarda. Material for this purpose is already being collected."

---

[1] Presented at the Montreal meeting of the American Pharmaceutical Association.

[2] The plants from the two sources were identified by Mr. L. S. Cheney, instructor in pharmaceutical botany at the University of Wisconsin.

The material, to which reference is made in the above paragraph, was collected weekly, as far as possible, and was obtained largely from the same field from which the previous material had been collected. There existed, however, a marked difference in the plants. The summer of 1895 having been exceedingly dry, the plants were rather small, and, on the whole, did not possess a healthy appearance. A noticeable difference in the oils also existed. Whereas, the oil distilled in 1894 was dark red in color, that distilled in 1895 from the same field was on the whole of a light yellowish color. Even, as in some instances, when the oil was slightly reddish in color when freshly distilled, this color disappeared upon standing. Further details, with regard to conditions of the herb and of the peculiarities of the oil obtained therefrom, will be given in a subsequent table.

It is of interest to note that a quantity of oil distilled from the herb growing under more favorable conditions and collected at a point only five miles distant from the former field, was dark red with a permanent dark red color.

It is still too early to state definitely from what part of the herb this coloring matter is obtained. It was thought, at first, to reside in the purplish stems. It was learned, however, that the presence or absence of those stems had no effect on the color of the oil. It may be worth mentioning in this connection that the yellowish oil was obtained from plants devoid of flowers, also with such in full blossom, but poorly developed seeds. On the other hand, dark red oil was obtained from plants in full blossom, in which the seed that had already formed seemed normally developed. It is too early, however, to attribute the coloring to the normally developed seeds. Possibly there is no relation between the two, the poorly developed seeds and the absence of volatile coloring matter being both due to the excessive drought. This subject, like other subjects pertaining to this oil, will be further investigated.

Experimental Part.—Inasmuch as the various specimens of the oil have been obtained at different intervals during the summer and early fall, it was of considerable interest to ascertain if the phenol constituent of these oils varied to any extent. Determinations were therefore made of each separate specimen.

The following table contains an enumeration of the oils obtained from plants collected near Chandler Street at different times during

No.	Date of Collection.	Description of Oil.	Part of Plants Used.	Specific Gravity determined shortly after distillation.	Specific Gravity redetermined in January, 1896.	Rotatory power.	Percentage of Phenol.
1	. . . June 21, 1895,	Light yellow,	From leaves only,	0·931 July 25,	0·931 at 24° C.	— 3° 16½′ in 220 mm tube,	65·2
2	. . June 26, 1895,	Light yellow,	From leaves only,	0·931 July 25,	0·931 at 25·5° C.	— 1° 19′ in 100 mm. tube,	67·6
3	. . July 2, 1895,	Yellow (turbid),	Leaves and stems,	0 932 July 25,	0·939 at 20° C.	— 2° 45′ in 220 mm. tube,	72·0
4	. . . July 9, 1895,	Light yellow,	Leaves, stems and buds,	0·936 July 25,	0·939 at 23° C.	— 2° 12·7′ in 220 mm. tube,	69·6
5	. . . July 16, 1895,	Light yellow,	Some stems and some flowers.	0.932 July 25,	0 937 at 21° C.	— 1° 44¼′ in 220 mm. tube,	66·8
6	. . July 23, 1895,	Light yellow,	Leaves, stems, flowers and buds,	0·932 July 26,	0·935 at 20° C.	— 0° 46′ in 100 mm. tube,	67·5
7	. . . July 30, 1895,	Greenish-yellow,	Leaves, stems and flowers,	0·935 Aug. 2,	0·941 at 15° C.	— 1° 45′ in 220 mm. tube,	72·0
8	. . Aug. 6, 1895,	Light yellow,	Stems, leaves, flowers and buds,	0·923 Aug. 8,	0·9261 at 20° C.	— 1° 1·7′ in 100 mm. tube,	65·5
9	. . . Aug. 13, 1895,	Light amber,	Stems, leaves, flowers and seed,	0·921 Aug. 15,	0·930 at 20° C.	— 2° 8′ in 200 mm. tube,	70·0
10	. . . Aug. 20, 1895,	Greenish-yellow,	Stems, leaves and bu	0·927 Aug. 22,	0·932 at 21° C	— 2° 3′ in 220 mm. tube,	64·4
11	Sept. 3, 1895,	Greenish-yellow,	Stems and leaves,	0·916 Sept. 5,	0·925 at 20·5° C.	— 2° 12½′ in 220 mm. tube,	58·0
12[2]	. . Aug. 9, 1895,	Light amber,			0·9311 at 20° C.	— 1° 2·9′ in 100 mm. tube,	63.0

[2] Collected near Lake Wingra.

the months June, July, August and September; also statements with reference to the parts of plants used, specific gravity and rotatory power of oil, as well as the results of a crude phenol estimation.

Estimation of Carvacrol.—The results of the carvacrol determinations recorded in Table I were obtained by shaking 25 c.c. of the oil with 75 c.c. of a 10 per cent. solution of sodium hydroxide. The amount of oil not dissolved by the soda solution was read off and the difference was calculated as carvacrol.

It is known, however, that strong solutions of caustic alkali particularly not only dissolved phenols, but other substances, hydrocarbons, alcohols, etc., as well. Oil No. 9, which, when shaken but once with a 10 per cent. soda solution, showed 70 per cent. of carvacrol; when shaken four times with a 5 per cent. solution of soda solution, showed only 54·8 per cent. carvacrol. Duplicate tests were made. The following table indicates the results of the repeated action of the soda solution in the oil on duplicate tests:

	I. Per Cent.	II. Per Cent.
First reading	26·0	30·8
Second reading	51·2	52·4
Third reading	54·4	55·2
Fourth reading	54·4	55·2

It thus becomes apparent that the amounts in Table I have only a relative value.

Phenol determinations of the dark oil obtained from plants collected at Picnic Point were also made. In one estimation the oil, however, was diluted with an equal volume of petroleum ether. With a 10 per cent. soda solution the undiluted oil showed 65·2 per cent. and 65·6 per cent., respectively. Diluted with petroleum ether, the oil showed, with 10 per cent. soda solution, 60·4 per cent. and 60·8 per cent., respectively; 100 c.c. of undiluted oil, shaken first with 300 c.c., then with 100 c.c., and lastly with 50 c.c. of 5 per cent. soda solution, gave, respectively, in duplicate tests, the following results:

	I. Per Cent.	II. Per Cent.
First reading	42·0	42·5
Second reading	52·5	53·5
Third reading	56·5	57·5

Titrimetric Estimation of Carvacrol.—Five grammes of the oil, diluted with 10 c.c. of petroleum ether, were repeatedly shaken with 5 per cent. sodium hydroxide solution until no more of the oil was dissolved. The oil was then tested for carvacrol by Flückiger's reaction, which consists in heating a few drops with chloroform and a little solid sodium hydroxide, when, if carvacrol is present, a wine-red color will appear. The absence of color will show that all of the carvacrol has been removed by the soda solution. The alkaline solution of carvacrol was made up with 5 per cent. solution to 100 c.c. or 200 c.c., as the case required. To 10 c.c. of this solution a sufficient quantity of $\frac{N}{10}$ iodine volumetric solution was added to convert all of the carvacrol into carvacrol iodide. To effect this a slight excess of iodine was necessary. In order to know when a sufficient quantity of iodine had been added, a few drops were removed from time to time, and added to some diluted hydrochloric acid. In this way free iodine can be detected as soon as it is in excess. The mixture was then made up to 500 c.c. and filtered. The carvacrol iodide did not separate readily, but separation could be induced by agitation of the milky liquid. To 100 c.c. of the filtrate, diluted hydrochloric acid was added, and the liberated iodine estimated with $\frac{N}{10}$ sodium thiosulphate volumetric solution. The quantity of $\frac{N}{10}$ sodium thiosulphate required, multiplied by 5, gives the quantity of $\frac{N}{10}$ iodine solution that had been added in excess. From this the amount of iodine required can be easily found.

Every molecule of carvacrol requires 4 atoms of iodine, therefore, every cubic centimetre of $\frac{N}{10}$ iodine volumetric solution is equivalent to 0·0037415 c.c. of carvacrol.

Only a few of the specimens of oil were tested according to this method.

No. of Oil.	By Titration. Per Cent.	By Volume.[3] Per Cent.	Percentage by Volume in 100-c c. Cylinder.[4] Per Cent.
1	(1) 52·00 (2) 52·30	64·0	65·2
2	(1) 54·70 (2) 54·00	66·0	67·6
7	(1) 58·48 (2) 58·00	70·0	72·0
	(1) 53·20 (2) 53·40	71·0	
10	(1) 53·34 (2) 53·36	64·5	64·4
	(1) 54·46 (2) 54·26	65·5	

Isolation of Carvacrol.—The aqueous alkaline solution containing the sodium carvacrolate was distilled with water vapor to remove any dissolved non-phenol portions of the oil. The solution was then acidulated with 50 per cent. sulphuric acid, and again distilled and identified as carvacrol iodide, into which all of it was converted. In the flask there remained a dark brown, tarry residue. An attempt to sublime this between watch-glasses proved a failure.

Non-Phenols.—The combined portions of non-phenols from the various oils were distilled with water vapor. The first portion came over very clear, and then a much darker portion. These were kept separate. The light portion had a specific gravity of 0·847 at 21° C., and rotatory power of 24′ in 22° mm. tube. The dark portion had a specific gravity of 0·874 at 21° C., and rotatory power of — 7° 50′ in 220 mm. tube.

In order to ascertain the presence or absence of esters in this portion of the oil, the following ester determinations were made:

Ten c.c. of the light portion were boiled for one hour with 50 c.c. of a 50 per cent. alcoholic potassium hydroxide solution. Upon titration of the alkali it was found that no saponification had taken place. The same experiment was tried with the dark portion with like results.

The light and heavier oils were then fractionated separately, the results of the fractionations being recorded in the following table:

---

[3] Burette reading. For further details, see "The Volumetric Estimations of Phenols," by Edward Kremers and O. Schreiner.

[4] Taken for comparison from the first table.

Fraction.	Light Oil.	Heavy Oil.	Total.
— 170°	75·0 c.c.	18·0 c.c.	9·30 c.c.
170°–180°	55·5 c.c.	47·0 c.c.	102·5 c.c.
180°–190°	5·5 c.c.	10·0 c.c.	15·5 c.c.
190°–200°	2·0 c.c.	11·5 c.c.	13·5 c.c.
200°–220°		11·0 c.c.	11·0 c.c.

The corresponding fractions were then mixed and refractionated. The results of the second fractionation, together with quantity, specific gravity and rotatory power of the fractions, are recorded in the last table:

Fraction.	Quantity.	Specific Gravity.	Rotatory Power in a 100 mm. tube at 20°	$[a]_D$.
160°–165°	6·0 c.c.	0·8474 at 20° C.		
165°–169°	8·0 c.c.	0·8438 at 20° C.	— 2° 1′	— 2·37
169°–170°	8·5 c.c.	0·8460 at 20° C.	— 1° 30′	— 1·77
170°–171°	11·0 c.c.	0·8427 at 20° C.	— 1° 2′	— 1·22
171°–172°	9·0 c.c.	0·8628 at 20° C.	— 1° 0′	— 1·15
172°–173°	20·0 c.c.	0·8488 at 20° C.	— 0° 10′	— 0·19
173°–174°	20·0 c.c.	0·8682 at 20° C.	— 0° 8′	— 0·15
174°–175°	25·5 c.c.	{ 0·8440 at 24° C. 0·8652 at 4° C.	+ 0° 36′	+ 0·71
175°–176°	18·5 c.c.	{ 0·8480 at 24° C. 0·8663 at 4° C.	+ 1° 2′	+ 1·22
176°–177°	14·5 c.c.	0·8502 at 20° C.	+ 1° 34′	+ 1·84
177°–178°	11·0 c.c.	0·8547 at 20° C.	+ 1° 25′	+ 1·67
178°–179°	10·5 c.c.	0·8528 at 20° C.	+ 1° 35′	+ 1·88
179°–180°	9·0 c.c.	0·8573 at 20° C.	+ 1° 44′	+ 2·02
180°–182°	8·0 c.c.	0·8649 at 20° C.	+ 1° 35′	+ 1·83
182°–184°	9·0 c.c.	0·8650 at 20° C.	+ 1° 58′	+ 2·23
184°–188°	7·8 c.c.	0·8686 at 20° C.	+ 1° 45′	+ 2·01
188°–193°	0·5 c.c.			
193°–198°	0·5 c.c.			
198°–200°	2·5 c.c.			
200°–210°	3·5 c.c.			
210°–220°	3·0 c.c.			
220°–230°	1·0 c.c.			
230°–235°	2·0 c.c.			
235°–240°	11·5 c.c.	0·9430 at 20° C.		
Residue	3·0 c.c.			

This table emphasizes what was demonstrated a year ago. More oil is being distilled this year, so that larger fractions of the non-phenol constituents may be obtained for a more detailed chemical examination.

PHARM. CHEM. LABORATORY,
UNIVERSITY OF WISCONSIN.

ON A NEW KINO IN SPECIES FROM MYRISTICA.[1]

By Edward Schaer.

At the beginning of the present year, Professor Warburg, of Berlin, kindly forwarded to me a sample of an extract or secretion resembling official kino, which, with well-known liberality, had been put at his disposal by the Director of the Royal Gardens and Museums at Kew. The sample in question, labelled "Kât jadikai," that is to say, "Cutch-like product of jadikai" (Tamil name for Myristica) and known to be produced by incisions in the bark of Myristica malabarica, Lam., in South India, showed in its exterior appearance more direct analogy to the well-known Malabar kino than to the "Kâts" of Acacia (Cutch), or of Nauclea (Gambier). It consisted, like official kino, of smaller or larger angular transparent pieces, of a deep garnet color, in thin fragments. It was not altogether unlike small, broken dragon's blood in some respects, and the latter name has been used sometimes by natives and merchants for some kinds of kino (from Pterocarpus draco and P. erinaceus).

Not having been acquainted before that time with kino-like products from the genus Myristica, and following the suggestion of Professor Warburg, who was then preparing a monograph of the Myristicaceæ, I at once proceeded to a closer examination of the new substance, availing myself of the latest observations concerning the natural history of the different kinds of kino, especially of the drug derived from Pterocarpus marsupium (Malabar kino). Not only in its external appearance, but also in its behavior to water and other solvents, the "Kât jadikai," or kino from Myristica malabarica agreed almost entirely with Pterocarpus kino, giving a reddish, slightly turbid solution of feebly, but perceptibly, acid reaction to litmus paper. The other physical qualities, for the most part, proved to be the same as those described in Hanbury and Flückiger's "Pharmacographia," second edition (1879), p. 195. The same may also be stated concerning the more important and characteristic chemical reactions, when compared with the chemical behavior of official kino. In this respect I do not intend to enter into full details in the present note, the less so as an exhaustive examination of this new kino will depend on a much larger supply of the drug. It may suffice, therefore, to mention the most striking reactions

[1] *Pharmaceutical Journal*, August 8, 1896.

which the Myristica kino shares, without perceptible difference, with the drug of Pterocarpus:

(1) The reddish solution of the M. kino in cold water does not show at first any alteration on addition of a solution of a ferrous salt (sulphate); but a deep violet color appears as soon as the neutralization of the more or less acid liquid, either with an alkaline acetate or diluted lime water has been effected.

(2) The same or a very similar violet coloration is observed when the aqueous kino solution is shaken with iron reduced by hydrogen and then filtered; the liquid obtained in this way is not altered by warming and evaporation, whereas, similar solutions prepared with catechu rapidly turn green by warming in the open air ("Pharmacographia," p. 196). The violet-colored solution is decolorized by acids, and then assumes a red color on adding diluted caustic alkalies or alkaline carbonates.

(3) Inorganic acids, as well as soluble chromates and several metallic salts, as, for instance, lead and copper acetates, produce abundant amorphous precipitates in the aqueous solution, consisting of the metallic compounds of kino-tannic acid or an acid closely allied to the latter.

(4) The aqueous solution turns distinctly green on addition of a small quantity of ferric chloride dissolved in water or alcohol. In this reaction the ferric salt is reduced to the ferrous state, as is shown by adding to the diluted green-colored liquid a few drops of a solution of potassium ferricyanide, this reagent causing a deep blue coloration or precipitate.

(5) Neither diluted acids nor solutions of alkalies produce sensible changes of color in the aqueous or alcoholic solutions of kino; yet the pale brown precipitate (kino-tannic acid) produced by acids in the aqueous kino solution, after washing out the acid liquid and then again dissolving in water, deposits a red sediment (kino-red) on evaporation of the solution at 100°. The same substance—soluble with a fine deep raspberry color in alcohol—is likewise formed as a sediment, when kino is boiled for some time with a double or triple quantity of diluted hydrochloric acid (sp. gr. 1·03–1·05) and then allowed to cool. In all the above-described chemical reactions, the new kino, "Kât jadikai," the dried juice of the bark of Myristica malabarica behaved so much like true Pterocarpus kino, that I was first induced to think that there had been some mistake or confusion

in sending the drug from East India to the Kew Museum. Also the amount of ash (1·1 per cent. as the average of several determinations) was quite analogous to the amount of inorganic residue found in the better qualities of commercial genuine Malabar kino. Only in two respects was a negative result obtained in comparison with Pterocarpus kino, and also with certain kinds of Eucalyptus kino; that is to say, the substance in question neither yielded to ether even the smallest quantity of an organic compound of the quality of catechin or pyrocatechin (cf. "Pharmacographia," 1879, p. 196), nor was it possible to obtain any crystals of the kinoïn of Etti, by exhausting with ether the kino solution, first heated for some time with hydrochloric acid.

Under these circumstances I thought it advisable to apply to the Government's botanical garden, of Buitenzorg (Java), for samples of the inspissated secretions of the barks of either M. malabarica or other species of Myristica, and to compare such samples with the "Kât jadikai" received from Professor Warburg, and afterwards, in smaller quantity, directly from Kew, by the kindness of the director of the Royal Gardens. The samples which were sent to me a few weeks ago, and for which I am highly and gratefully indebted to the director, Dr. M. Treub, as well as to the assistant director, Dr. P. van Romburgh, consisted of small portions of the still liquid juice of the bark of (*a*) Myristica glabra, (*b*) "kapoeas," from M. species, and (*c*) M. succedanea, as well as of a few grammes of dried kino-like substance, drawn from M. fragrans, which I received within the last few days.

The examination, conducted in the same way as that of the special sample, "Kât jadikai," from Kew, showed very soon that the three liquid kinos agreed completely in all the five reactions discussed above, with the concentrated aqueous solution of the dried juice of M. malabarica, of Kew, exception being made with regard to a very curious turbidity and microcrystalline sediment, which was removable by filtration. The three filtered juices, by careful evaporation at temperatures of 50° to 70° C., gave dry residues quite similar in every respect to the first examined "Kât jadikai," while the same liquids, evaporated without previous filtration, formed a much paler residue. These last-mentioned kino-like dry residues presented the same appearance of a pale reddish-brown extract as the dried bark juice of the official Myristica fragrans, kindly forwarded by the directors of the Buitenzorg Gardens.

Yet, in spite of the far-reaching and chemical analogies existing between the official Pterocarpus kino and the substance drawn from the different Myristica species, and therefore to be called Myristica kino, a very striking difference has already been signalized by Dr. van Romburgh, and further confirmed in the research carried out in my laboratory, as far as the modest quantities of the new liquid and dry kinos would permit. The liquid juices of M. glabra, "kapoeas," from M. species and M. succedanea, as well as the liquid obtained by shaking and dissolving the dry kino of M. fragrans with a ten-fold bulk of water or weak alcohol, appeared very turbid after short agitation; observed with the microscope, they showed, in great number, larger prismatic or smaller needle-shaped crystals, which deposited as a whitish micro-crystalline sediment when the juices were allowed to stand for even a short time. The crystals were much more abundant and conspicuous, as may readily be imagined, when the dry inspissated natural juices were dissolved in a little water or diluted alcohol, and then placed under the lens. In this way it could be shown that even the pretty translucent "Kät jadikai" of Kew (M. malabarica), probably obtained by evaporation of an already sedimented juice, contained an appreciable number of the above-mentioned crystals, and ought, therefore, to be considered as a genuine "Myristica kino."

This crystalline sediment, however, was not, as might perhaps have been supposed, an organic compound of some affinity to the substances eudesmin and aromadendrin, lately observed by Maiden and Smith in several kinds of myrtaceous kinos of Australia (cf. *Pharm. J.* (IV), Vol. I, p. 261, September 28, 1895), but proved to be of partly inorganic character, a fact which at once could be deduced from its behavior on platinum foil, insolubility in alcohol, and solubility in several reagents. The nature of the micro-crystalline constituent of the liquid M. kino had already been noted in a letter received from Dr. Treub, of Buitenzorg, dated May 12th, which contains the following communication:

"Dr. van Romburgh tells me that these juices deposit a white crystalline substance, which seems to be the magnesium or calcium salt of an organic acid. But he has not yet got a sufficient quantity of material for a thorough examination." The presence of a micro-crystalline deposit, as already mentioned, could be observed in all the samples of kino, but was most conspicuous in the case of the juice of M. succedanea. Thinking it rather doubtful whether there

would be any opportunity in Buitenzorg for collecting a sufficient quantity of Myristica juice, or of its crystalline sediment, for the purpose of a chemical analysis on a larger scale, I judged it worth while to attempt to determine the chemical nature of the scanty deposit isolated from the liquid kino of M. fragrans, by making use of the crystallographic and optic appliances of the University.

After having shown, with some degree of certainty, that the crystals of the deposit consist of an organic calcium salt, decomposable by mineral acids, and yielding by treatment with diluted sulphuric acid, the very characteristic cross-like bundles of needle-shaped prisms of calcium sulphate; and secondly, that according to their chemical behavior and their crystalline form they could not be calcium oxalate, but rather showed the greatest analogy to a calcium tartrate artificially prepared from Rochelle salt and calcium chloride, I forwarded the remaining small quantity of crystals to my friend and colleague, Dr. H. Bücking, Professor of mineralogy at Strasburg, who had kindly offered his co-operation in settling the question by transforming the crystals into the optically well-definable and characteristic salts, barium tartrate and antimonyl-barium tartrate [$Ba(SbO)_2(C_4H_4O_6)_2.2H_2O$]. The result of his examination was the discovery that the crystals isolated from Myristica kino and the artificial calcium tartrate (neutral salt) both equally formed the sphaerolithic and feathered bundles of the first-named barium salt, as well as the partially six-sided and partially rhombic plates of the antimonyl-barium salt. The kino crystals ought, therefore, to be considered as calcium tartrate. However, notwithstanding the fact that the chief bulk of the crystalline deposit of the Myristica juice consists of the mentioned calcium salt, the observation that the crystals do not seem to be soluble entirely without the slightest residue either in cold solution of potassium hydrate, or in diluted acetic acid, makes it not wholly improbable that the said deposit may perhaps contain a small admixture of calcium oxalate, which is so widely spread in the cellular tissues of plants. This question will have to be settled at some future occasion. I am not aware that, besides calcium oxalate, sulphate, phosphate and carbonate (occurring in amorphous form in the so-called cystoliths), calcium tartrate has been very frequently found as a crystalline secretion in vegetable organs, since the observation of Schimper, who proved its existence in the leaves and petioles of Ampelopsis and of Vitis, especially of V. lubrusca. Consideration of the well-known presence of soluble

tartaric salts in fruits and other parts of plants leads one to think that a frequent secretion of crystallized calcium tartrate would not seem improbable.

The results of the foregoing investigation may be summed up as follows:

(1) The dried juices of the bark of several Asiatic species of Myristica—for instance, of M. malabarica, Lam., and M. fragrans, Houtt[2]—as regards their appearance and physical qualities, show but little difference from the official Malabar kino.

(2) These substances, which may be termed "Myristica kinos," agree, in the chemical reactions due to their constituents, in all important points, with the kino of Pterocarpus marsupium. It can, therefore, be stated that drugs of a very similar character, and partly close resemblance to official kino, are to be found in the families of Leguminosæ (Butea, Pterocarpus, Milletia), Saxifragaceæ (Ceratopetalum), Myrtaceæ (Eucalyptus, Angophora) and Myristicaceæ.

(3) The Myristica kino differs, as far as can be observed, from the Pterocarpus kino, and probably also from Butea and Eucalyptus kino, by containing, in the crude state of the inspissated fresh juice, smaller or larger amounts of a distinctly crystalline calcium salt, viz.: calcium tartrate, suspended in, and depositing from, the liquid juice. By this characteristic admixture it can be easily distinguished from the official kino, and probably also from other kinos of commerce.

Whether this new substance might ever be obtained in combination with the production of nutmegs and mace, so as to play the part of a commercial drug, will depend, above all, upon a still better knowledge of its qualities, its formation in the living plant, its quantitative relations and similar questions. Perhaps it may be possible, at another date, to give some more particulars, as I hope to do, in connection with Dr. van Romburgh, who has been first to observe the peculiar micro-crystalline character of this Myristica kino.

---

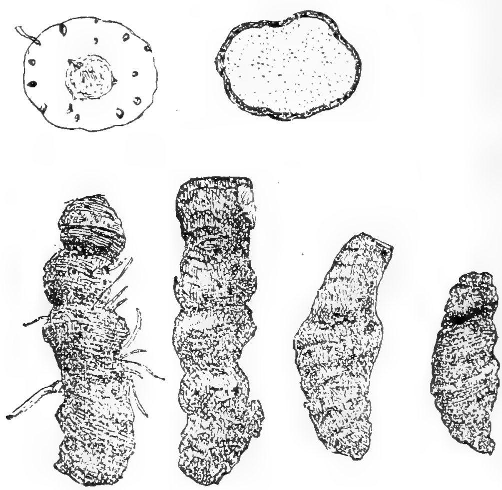
[2] In Watts' "Dict. of the Econ. Prod. of India," Vol. V, p. 314, it is stated that Myristica longifolia, Wall., an evergreen tree of Sikkim, Khasia Hills, Assam, Pegu, and Tennasserim, according to the botanist Kurz, "exudes a red resin." The writer would be obliged for any sample of this substance, in order to compare it with the other Myristica kinos mentioned in this paper.

SPURIOUS BLOOD ROOT.[1]

BY E. M. HOLMES, F.L.S.

As a rule, drugs are adulterated only when they are high in price, and then with others that are less expensive. When this is not the case the term adulteration can scarcely be applied. A commercial sample of the rhizome of Sanguinaria Canadensis that recently came under my notice contained another more expensive rhizome, very like it in shape but differing slightly in color, to the extent of about 40 per cent.

2c. 1c.



2a. 1a. 1b. 2b.

1. Sanguinaria Canadensis: *1a*, showing annual growth, and *1b*, with traces of leaf scars. *1c*, transverse section magnified.

2. Chamaelirium Carolinianum: *2a*, showing annual growth and endogenous character of rootlets. *2b*, younger rhizome. *2c*, transverse section magnified.

This rhizome I have been able to identify with that of Chamaelirium Carolinianum, Willd., better known as Helonias dioica. As this rhizome is nearly three times as expensive as Sanguinaria, it was obviously an admixture, either through ignorance of the exporter or through carelessness. Instances of this kind are comparatively rare, but serve to remind the retail pharmacist that he, and

[1] *Pharmaceutical Journal*, July 11, 1896.

not the wholesale houses, is really responsible for the safety of the public.

The rhizome of Chamaelirium Carolinianum, Willd. (*C. luteum*, A. Gray) was found by Dr. F. V. Greene to contain a bitter principle called *chamaelirin*, which is stated to act as a cardiac depressant, *i. e.*, exactly opposite to the primary action of Sanguinaria. In medicine the rhizome is used as a tonic, diuretic and anthelmintic.

The two rhizomes may be distinguished as follows: That of S. Canadensis has an annual growth marked by constrictions, giving to it a knotted or moniliform appearance. It is scarred with the appressed bases of the leaves, which form not very obvious dark lines on the surface, about 2 mm. apart. Rootlets are rarely present, and are very slender, blackish and easily broken off. The transverse surface of the rhizome, when cut, shows either a uniform dark blood-red color or a whitish starchy surface, with numerous red dots scattered over it. The root bark forms a thin blackish line.

The rhizome of Chamaelirium is almost identical in size and general appearance, but the transverse marks are much more numerous, and form whitish wavy lines, only ½ mm. apart, and as seen under a good lens, they project at right angles to the rhizome. The external surface of the rhizome is grayish, and the rootlets are evidently those of a monocotyledon, as they are not continuous with the outer surface, each leaving a small hole when broken off, thus giving to the rhizome a perforated appearance, which is, of course, not seen in Sanguinaria. The transverse surface is of a dirty white hue and horny texture, and exhibits a well-defined central column occupying about one-third of the diameter, and containing irregularly placed vascular bundles. The outer portion surrounding the central column shows a few scattered holes containing traces of the rootlets, but there are never any red resinous dots present, as in Sanguinaria. It is easily detected, therefore, by the grayish surface perforated with small holes, and by the transverse section exhibiting a well-defined central column.

Pennsylvania Mountain Tea.—Under this name the leaves of one of the Golden Rods, *Solidago odora*, are in very common use as tea, by the families of the German race in the interior of Pennsylvania. Men gather the leaves in the summer-time, and many are said to make a good living at the work. They peddle it in the winter-time.—*Meehan's Monthly for August, 1896.*

A CONTRIBUTION TO THE KNOWLEDGE OF SOME NORTH AMERICAN CONIFERÆ.

By Edson S. Bastin and Henry Trimble.

(*Continued from page 422.*)

GENERAL CHARACTERS OF THE GENUS ABIES.

The most important distinctions between this genus and that of Picea, already described, are the following: (1) the leaves are flat, instead of quadrangular; (2) although spirally inserted as in Picea, they are, on the horizontal branches, usually deflected laterally, appearing two-ranked or pectinately arranged; (3) the leaf-scars do not project and are nearly circular in outline; (4) there are no resin-ducts in the xylem; (5) the cones are erect and arranged on the upper sides of spreading branches.

ABIES BALSAMEA, LINK.

DISTRIBUTION AND GENERAL CHARACTERS.

This is our common balsam fir, or, as it is also called, the balm of Gilead fir. It occurs throughout our Northern borders, from Maine to Minnesota, and northward to Hudson's Bay, and on the eastern slope of the Rocky Mountains of British America and the Northern United States. It also occurs in New Brunswick, Nova Scotia and Newfoundland. The tree attains a height of from 60 to 90 feet, and a diameter near its base of from 18 to 24 inches. It thrives best in rather swampy soil, or at least where there is an abundant supply of water. Its trunk is smooth, dark grayish-brown, with numerous balsam blisters in the bark, and showing from the outside; it is very straight and has numerous whorled, horizontally spreading branches, which gradually diminish in length upwards, so that the top is very symmetrically spire-shaped. The bark strips readily, the wood is white or very light brown, the heart-wood but slightly darker than the sap-wood. The wood is of low specific gravity, soft, but compact, and not very durable. No large tap-root is formed, but the roots spread out horizontally near the surface. They are covered with a deep red bark, which at the surface peels off in scales.

MICROSCOPICAL STRUCTURE.

Sections of a twig two years old showed the following characteristics: The middle bark contained numerous secretion reservoirs

filled with oleoresin, some large mucilage sacs irregularly distributed, and numerous parenchyma cells of relatively small size, most of them containing tannin. There were also in the outer portion of the middle bark a few stone cells, either isolated or in clusters of

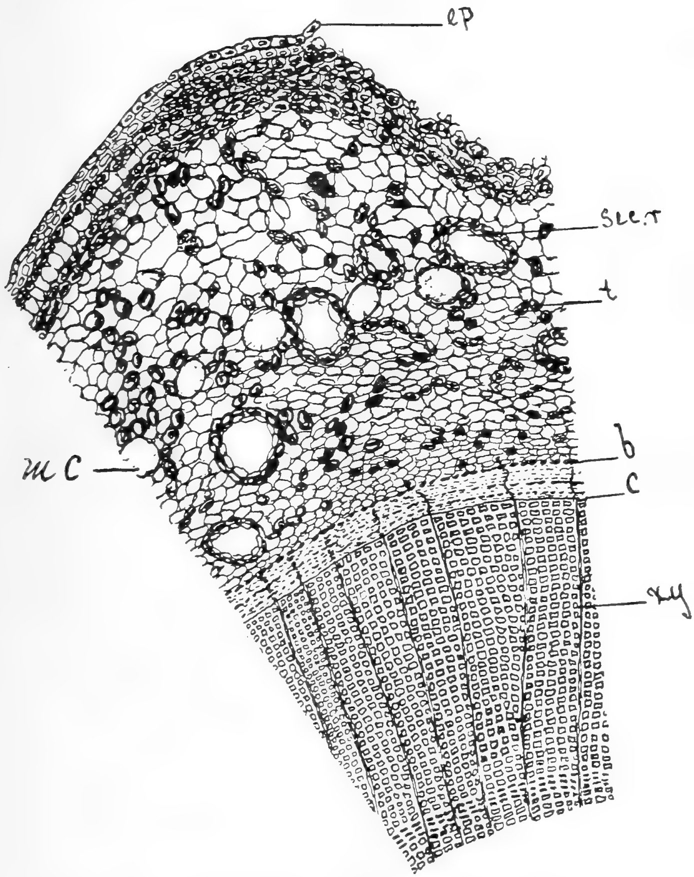


Fig. 46.—Portion of cross-section of stem of Abies balsamea, magnified 75 diameters. *Ep*, portion of remaining epidermis ; *sec. r.*, one of the resin passages in the middle bark ; *t*, a tannin cell in middle bark ; *m. c.*, mucilage cell ; *b*, band of tannin cells in bast layer ; *c*, cambium zone ; *xy*, xylem containing medullary ray cells and discigerous tracheids.

a few. The inner or bast layer consisted mostly of small cells arranged in radial rows. The tannin cells of this layer were of larger size than the cells of the adjacent tissues, and were arranged

for the most part in tangential rows, but some occurred in the medullary rays, and hence were in radial rows. The xylem was without secretion reservoirs, and the tannin cells, as in the genus Pinus, were chiefly confined to the medullary rays and pith.

An examination of a stem several years old showed, besides a greater formation of cork, numerous scattered clusters of stone cells, some of them branching and with the branches often considerably elongated. They occurred in the outer portion of the bast layer. Possibly the more fibrous, branching forms are to be regarded as imperfectly developed bast fibres, forecasting the bast fibres that occur in Larix.

The leaves are linear, sessile, ½ to ¾ inch long, and about $\frac{1}{16}$ inch in width, smooth, dark green and depressed along the mid-rib

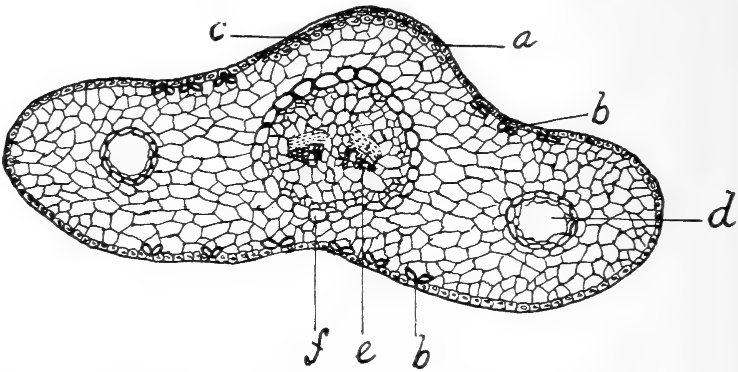


Fig. 47.—Cross-section of leaf of Abies balsamea, magnified 75 diameters. *a*, epidermis ; *b*, *b′*, stomata ; *c*, hypoderma ; *d*, resin passage ; *e*, one of the two small fibro-vascular bundles ; *f*, endodermis.

above, silvery-white on each side of the prominent mid-rib below, and usually slightly notched at the apex. A few stomata occur on each side of the mid-rib on the upper surface, but they are much more numerous in the silvery-colored areas on the lower surface. An examination under the microscope showed the epidermis to be composed of small, rather thick-walled cells. There was no hypoderma observed except along the mid-rib on the lower surface. The leaf contained two resin-passages of large size, with the walls of its strengthening cells but slightly thickened. These passages were buried in the mesophyll, a little nearer the margin than the mid-rib. The mid-rib was composed of two divergent collateral bundles, of

small size, separated from each other by large, thin-walled cells and surrounded by a several-layered pericycle, in which occurred a few thick-walled fibres. The endodermis enclosing the whole was composed of rather large cells, which had their walls but slightly thickened; they formed a nearly perfect circle, and not an ellipse, as in the Pinus. The mesophyll cells had perfectly plain walls, that is, they were neither wavy nor folded. They contained much tannin.

CHEMICAL COMPOSITION.

Proximate Analysis of Root Bark.—Absolute alcohol extracted 18·55 per cent. of a red-brown extract. Petroleum ether had very little solvent effect upon this extract, indicating but a small amount of volatile oil. Water dissolved an amount of it equal to 10·60 per cent. of the weight of the bark. The remainder was red-brown resinous matter. After treating the bark with absolute alcohol it was exhausted with water. The water solution contained glucose and a small amount of mucilage. This sample of bark contained 8·95 per cent. of moisture. It was collected in July.

Proximate Analysis of Stem Bark.—The material was taken from the tree that yielded the root bark used in the foregoing analysis. The absolute alcohol extract amounted to 18·07 per cent. It was of a green color and softened when warmed. Some of the oleoresinous and coloring matter dissolved in petroleum ether. When the residue was treated with water 9·92 per cent. of resinous matters and chlorophyll were left undissolved. Water applied to the bark, after extracting it with absolute alcohol, dissolved glucose and a very considerable quantity of mucilaginous substance. The moisture in this sample of the bark amounted to 7·40 per cent.

Proximate Analysis of Leaves.—Some recently-collected leaves were found to yield 13·53 per cent. of a very dark green extract when exhausted with absolute alcohol. Petroleum ether dissolved a considerable quantity of the coloring matter and volatile oil. Water dissolved the tannin and some other constituents, but left 3·01 per cent. of resinous matter and chlorophyll undissolved. After treating the leaves with absolute alcohol, water was applied to the residual bark. The water solution was found to contain glucose and a small amount of mucilage. The leaves used in the analysis contained 41·26 per cent. of moisture. They were collected in September, 1896.

Some estimations of the tannin, moisture and ash in the barks and leaves of Abies balsamea, collected in June, 1896, were made. The tree which furnished all the parts was a nursery specimen, grown at West Chester, Pennsylvania. The results were as follows:

	Moisture.	Ash in Absolutely Dry Material.	Tannin in Absolutely Dry Material.
Root bark	9·89	5·68	11·93
Stem bark	9·36	3·37	12·49
Leaves	10·18	4·48	5·13

The ash in each case was found to be composed of potassium, calcium and traces of iron, in combination with carbonic and phosphoric acids and small quantities of silica.

The aqueous solutions of the several parts, when separately tested with ferric chloride and bromine water, gave reactions which indicated that the tannins in solution belonged to the oak-bark group. To more clearly determine this matter, a sample of tannin was prepared from a mixture of the stem and root barks, dried at 120° C. and submitted to ultimate analysis. The results were the following percentages:

Carbon	60·41
Hydrogen	6·21

These figures substantiate the relation referred to, although the percentage of hydrogen is about 1 per cent. higher than that obtained from a number of other tannins of the oak-bark group. In view of the qualitative reactions, it is proposed to allow this analysis to stand for the present, to represent what would almost certainly be obtained for the tannins of the other members of the genus Abies.

The most important constituent from this tree is the oleoresin, better known as balsam of fir; but the chemistry of this product has been investigated but little. Hunkel,[1] in 1895, studied the distillate obtained from the leaves and twigs, and found it to consist of

[1] AM. JOUR. PHARM., 67, 12.

lævogyrate pinene, lævogyrate bornyl acetate and a crystalline compound which was not investigated.

Balsam of fir is collected chiefly in the Province of Quebec, Canada. A full description of the industry, by Saunders, was made to the American Pharmaceutical Association in 1877, and published in the *Proceedings* of that year.

ECONOMICS.

The wood of this species of fir is used for masts and, to some extent, for lumber. The balsam of fir, an oleoresin, is a most useful product, especially as a mounting medium in microscopy. The output in Canada has amounted to 5,000 gallons per year. The tree is extensively employed for ornamental purposes in lawns.

ABIES FRASERI, LINDLEY.

DISTRIBUTION AND GENERAL CHARACTERS.

This species is commonly called the double fir, probably from the dense arrangement of its leaves. It occurs at high elevations in the mountains of Tennessee and North Carolina. The tree attains a height of from 50 to 70 feet, and a diameter near the base of from 15 to 22 inches. In appearance it closely resembles the balsam fir, but differs in the fact that its leaves are smaller and more compactly arranged on the branches, and in its cones, which are only about half as long and about two-thirds as thick as those of the balsam fir. The cones are also brown in color, and the bracts are longer and reflexed. The wood closely resembles that of the balsam fir, except that the bands of summer cells are somewhat broader.

MICROSCOPICAL STRUCTURE.

Sections of a twig five years old showed the following characteristics: The resin passages were apparently less numerous and smaller than those of A. balsamea, and the mucilage cells were more numerous and of very large size. There were clusters of stone cells, some of them branching and fibrous, resembling those in the outer part of the bast of A. balsamea, and similarly located. The tannin-bearing cells of the middle and inner bark were similar in size and arrangement to those of A. balsamea. The medullary rays of the wood and many of the parenchyma cells of the pith contained tannin.

The leaves are from ⅓ to ½ inch long, rather narrower at the base than at the apex, that is, somewhat wedge-shaped, leathery and minutely notched at the apex. The stomata occur chiefly on the

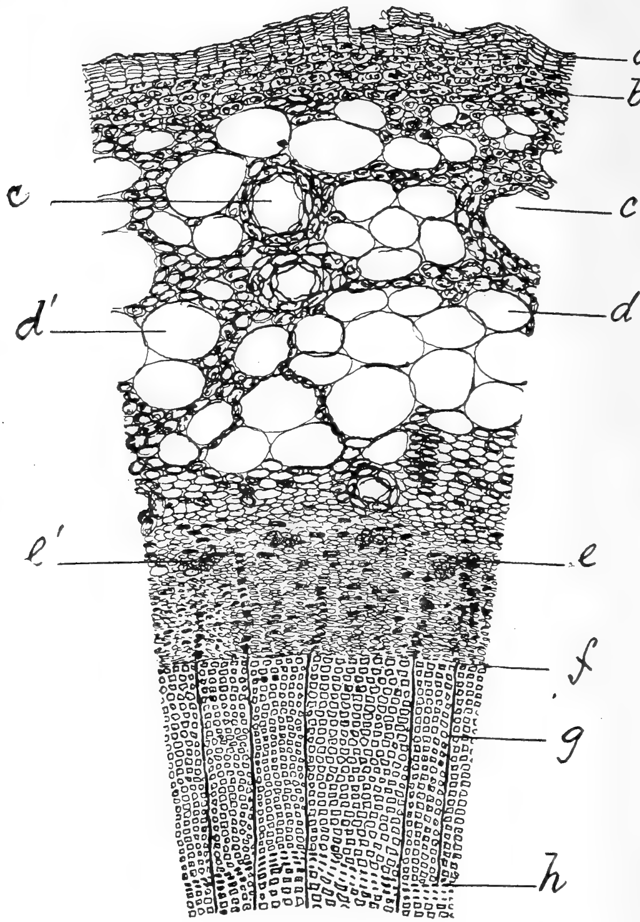


Fig. 48.—Part of cross-section of stem of Abies Fraseri, magnified 75 diameters. *a*, periderm layer; *b*, layer beneath, consisting of a parenchyma rich in tannin; *c*, *c'*, resin passages; *d*, *d'*, large cells containing mucilage and traces of tannin; *e*, *e'*, clusters of stone cells in outer bast; *f*, cambium zone; *g*, medullary ray consisting of cells containing tannin; *h*, ring of growth.

under surface in two silvery bands, one on each side of the mid-rib. There are about seven rows of stomata in each band. A few stom-

ata occur on the upper surface near the mid-rib, and toward the apex of the leaf.

The epidermis was found to be composed of thick-walled cells of

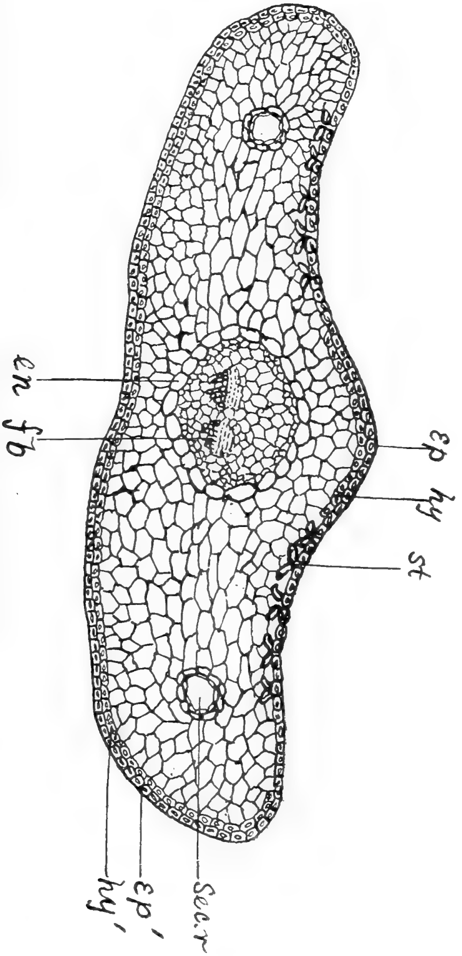


Fig. 49.—Cross-section of leaf of Abies Fraseri, magnified 75 diameters. *Ep Ep'*, epidermis ; *hy*, *hy,'* hypoderma ; *st.*, stoma on lower surface of leaf ; *sec. r.*, resin passage ; *f. b.*, fibro-vascular bundle ; *en*, endodermis.

small size. A hypoderma composed of one layer of thick-walled cells occurred on the upper surface, at the edges, and opposite the mid-rib on the lower surface. The two secretion reservoirs occurred,

one on either side, nearer the margin than the mid-rib, and buried in the mesophyll. The strengthening cells surrounding the reservoirs had their walls but slightly thickened. In other respects, the structure resembled that of the leaf of A. balsamea.

CHEMICAL COMPOSITION.

The tree which yielded all of the material employed was a specimen from Johnson City, Tenn. It was taken from the ground in July, 1896. The following table embodies the percentage results of the investigation:

	Moisture.	Ash in Absolutely Dry Material.	Tannin in Absolutely Dry Material.
Root bark	9·63	2·24	12·28
Stem bark	8·95	2·52	11·03
Leaves	6·85	3·46	6·93

The ashes contained potassium, calcium and traces of iron, combined with carbonic and phosphoric acids, and a small amount of silica.

This tree is said to have been used to furnish a balsam of fir, similar to that obtained from A. balsamea, but the data concerning this are obscure. The tree is also used for ornamental purposes. It is noted for its extreme hardiness.

ABIES NORDMANNIANA, SPACH.

DISTRIBUTION AND GENERAL CHARACTERS.

This highly ornamental tree, now much cultivated in this country, is a native of the Crimea and the Caucasus Mountains. It attains a height of 80 feet or more, and a diameter of about 2 feet. The timber is harder and more durable than that of the American species described. The branches are whorled, densely arranged, the lower horizontal, the upper ascending, and the top is spire-shaped. The cones are large, ovate, about 5 inches long by 2½ inches thick. The bractea adhere to the base of the fruiting scales, finally exceed them in length, and become reflexed at the apex. They are widened from the base upward, that is they are wedge-shaped.

MICROSCOPICAL STRUCTURE.

Sections of a twig six years old were examined. There were rather numerous resin passages in the middle bark, a few large mucilage cells, and numerous tannin cells of smaller size. The

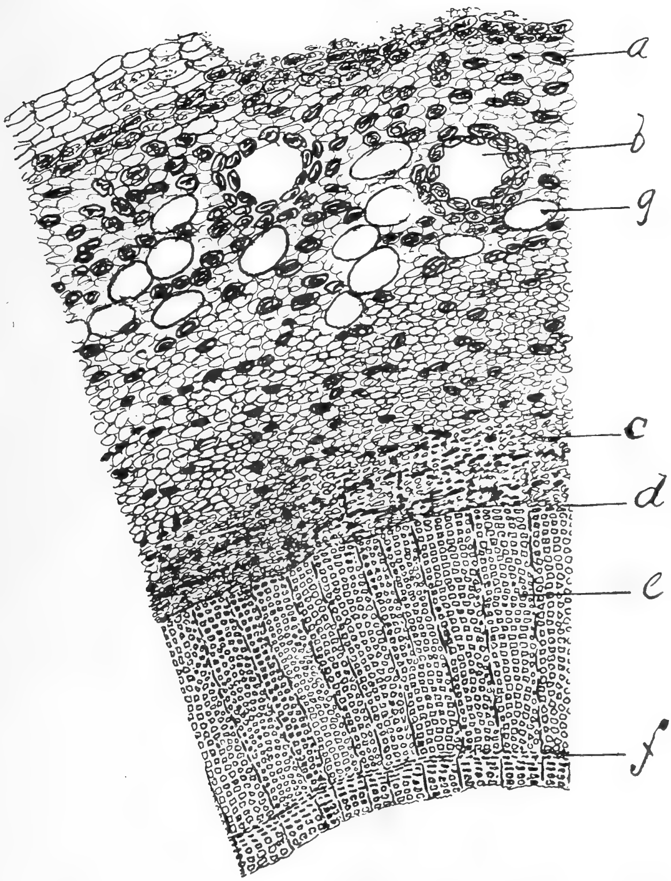


Fig. 50.—Part of cross-section of stem of Abies Nordmanniana, magnified 75 diameters. *a*, tannin cell in outer portion of cortex; *b*, secretion reservoir surrounded by tannin-bearing cells; *c*, tannin cell in bast layer; *d*, cambium zone; *e*, xylem; *f*, ring of growth; *g*, mucilage cell in middle bark.

tannin cells of the inner bark were of larger size than those of adjacent tissues, and mostly arranged in radial and tangential rows, though less distinctly so than in A. balsamea. No lignified tissues

were observed in the bark, although it is possible they may appear in the outer bast of older stems.

The leaves are compactly arranged, mostly appearing two-ranked,

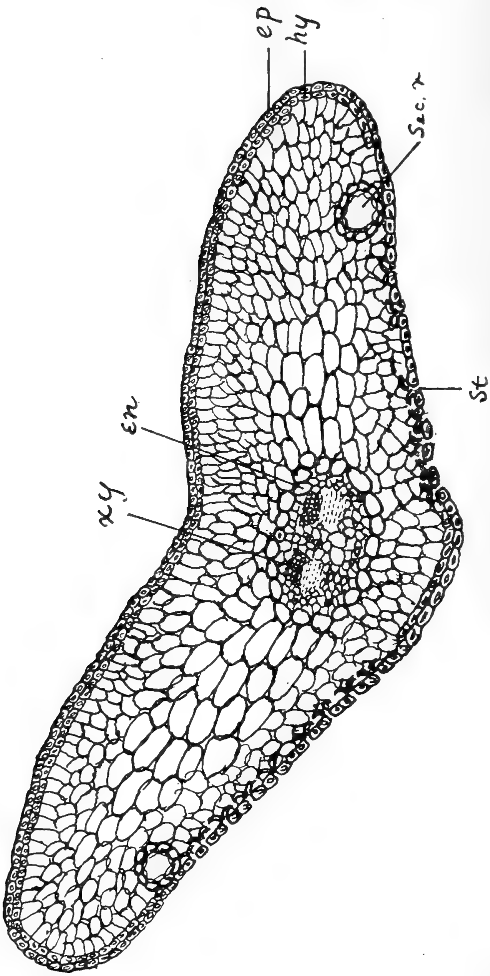


Fig. 51.—Cross-section of leaf of Abies Nordmanniana, magnified about 60 diameters. *xy*, xylem of one of the two bundles enclosed by the endodermis, *en*; *ep*, epidermis; *hy*, hypoderma; *sec. r.*, resin passage; *st*, stoma.

about 1 inch long and $\frac{1}{12}$ inch wide, contracted at the base and notched at the apex, leathery, dark green and glossy above, and with a prominent mid-rib bordered on either side by a silvery band

caused by the stomata below. Each silvery band contains seven or eight rows of stomata. No stomata were found on the upper surface.

The epidermal cells were of small size and thick-walled. A hypoderma was present, and usually one-layered on the upper surface, at the edges and along the mid-rib on the dorsal surface, but absent elsewhere. The resin passages were two in number, located on the lower surface next the epidermis, and about one-third of the distance from the margin to the mid-rib of the leaf. The mid-rib was similar in structure to that of the other species described. In old leaves, the tissues immediately surrounding the fibro-vascular bundles showed some scattered lignified fibres, and the large endodermal cells, though but slightly thickened, showed some lignification.

The mesophyll cells were, like those of the other species here described, plain-walled and their contents abounded in tannin.

CHEMICAL COMPOSITION.

The tree yielding the materials used in the investigation was taken from the ground in April, 1896. The percentage results were as follows:

	Moisture.	Ash in Absolutely Dry Bark.	Tannin in Absolutely Dry Bark.
Root bark	10·95	5·85	9·14
Stem bark	9·50	3·97	10·52

The ash from both barks consisted of potassium, calcium and iron, combined with carbonic, sulphuric and phosphoric acids and traces of silica.

ECONOMICS.

Nordmann's fir is used chiefly as an ornamental tree.

ABIES WEBBIANA, LINDLEY.

KING FIR. DYE FIR.

This fir occurs in the Himalaya Mountains, at an elevation of from 7,000 to 10,000 feet, extending to Afghanistan. It attains a height of 150 feet, and a stem circumference of 30 feet. The wood is soft-grained and very resinous. The natives extract a violet dye from the cones.

The dried leaves are known as Talispatra in India, and are regarded as carminative, expectorant, stomachic, tonic and astringent.

A small quantity of bark from this fir has been received from A. E. Wild, Conservator of Forests, Bengal, India. This bark, on investigation, yielded the following results:

	Per Cent.
Moisture	11·69
Ash in dry material	1·90
Tannin in dry material	7·81

The tannin was separated from the remainder of the bark, and, after purification, it yielded the following percentage composition on ultimate analysis:

Carbon	59·91
Hydrogen	5·12

These results indicate it to belong to the oak-tannin group.

(*To be continued.*)

RECENT CONTRIBUTIONS TO PHARMACY.

MESCAL BUTTONS.

Ervin E. Ewell, in a recent article on "The Chemistry of the Cactaceæ" (*Jour. Am. Chem. Soc.* **18**, 624), gives an interesting account of this substance, which, in its commercial form among the Indians of the Southwestern United States, appears to be the dried cactus, Anhalonium Lewinii. Other members of the order Cactaceæ are possibly also used, and likewise other species of the genus Anhalonium.

The plant is held sacred by the Indians, and the "buttons" are consumed in some of their religious ceremonies.

Dr. Lewin announced an alkaloid in Anhalonium Lewinii, in 1888. This alkaloid has been prepared by Mr. Ewell, in considerable quantity, and in a high state of purity. The chloride crystallizes from alcohol. A second, and, very recently, a third alkaloid have been separated from the drug. All three of these alkaloidal preparations have been subjected to physiological tests, and the results will soon be published. The third alkaloid has been found to be much stronger than any other alkaloid hitherto separated from any member of the genus Anhalonium, as 0·02 to 0·025 gramme of its hydrochlorate per kilo of body weight is fatal to rabbits, and 0·03 gramme suffices to kill a full-grown guinea pig. Further work is in progress on this drug.

IODOTANNIC AND IODOGALLIC SYRUPS.

Iodotannic syrup, which is a rather ancient French preparation, has recently been revived, and is now frequently prescribed.

Professor F. Gay (*Répertoire de Pharmacie*, April, 1896), of Montpellier, France, has recently reviewed the older formulas of Berthet (1836), of Perrens, of Guilliermond (1854) and others, most of which contained rhatany, and proposed the following:

IODOTANNIC SYRUP.

	Grammes.
Iodine	1
Alcohol, 90°	12
Tannin	1
Simple syrup	1,000

Dissolve the iodine in the alcohol by trituration (or take 13 grammes of recent tincture of iodine), add the tannin, then the syrup and heat to near the boiling point; filter when the syrup does not give a blue color with solution of starch.

IODOTANNIC SYRUP WITH RHATANY.

	Grammes.
Iodine	1
Alcohol, 90°	12
Syrup of rhatany	500
Simple syrup	500

Mix as in the previous formula.

IODOGALLIC SYRUP.

(Syrup of Iodogallic Acid.)

	Grammes.
Iodine	1
Alcohol, 90°	12
Gallic acid	1
Simple syrup	1,000

Mix as in the previous formulas.

The following is the formula of the *Société de Pharmacie de Paris*:

	Grammes.
Iodine	1
Alcohol, 90°	14
Syrup of rhatany	985

Dissolve the iodine in the alcohol, mix with the syrup, allow to stand twenty-four hours.

The older formulas differed but slightly from these, but contained more tannin and iodine.

It was found that iodine effected an inversion of the cane sugar.

The author concluded that those syrups made by allowing the iodine and tannin to react on each other, formed a true iodotannic syrup, while in those in which all the ingredients were mixed at once, the solution of the iodine was effected by the inversion of a portion of the sugar.

ON THE OCCURRENCE OF QUERCETIN IN THE OUTER SKINS OF THE BULB OF THE ONION (ALLIUM CEPA).

Perkin and Hummel, in the *Proc. Chem. Society*, 1896, p. 144, report on the occurrence of quercetin in the outer skins of the bulb of the onion (Allium cepa).

It was stated that Zeuch (*Farben und Farbenkünde*, 1825, **1**, 434) has described the dyeing properties of these skins. The authors obtained the coloring matter in the form of glistening yellow needles, of the formula $C_{15}H_{10}O_7$, which yielded compounds with mineral acids; the sulphuric acid compound $C_{15}H_{10}O_7$, H_2SO_4 was analyzed. On acetylation, a compound, $C_{15}H_5O_7(C_2H_3O)_5$, forming colorless needles, melting point 190–191°, was obtained, and, by decomposition with fused alkali, phloroglucin and protocatechuic acid formed the principal products. With mordants it dyed shades similar to those given by quercetin, the coloring matter of quercitron bark, and was thus proved to be identical with this substance.

Comparative dyeing experiments showed that the coloring matter of onion skins was quite equal to that of such well-known dyestuffs as old fustic and quercitron bark.

THE DETECTION OF COPPER IN VEGETABLE SUBSTANCES.

Messrs. Paul and Cownley, in the *Pharmaceutical Journal* of June 6, 1896, refer to a paper by Dr. Victor Vedrödi, in the *Chemiker Zeitung* of May 16, 1896, in which the accuracy of the method of Prof. Lehmann for the determination of copper in vegetable substances is questioned.

The authors, after pointing out the liabilities to error in both the methods of Dr. Vedrödi and Prof. Lehmann, give one of their own, which they consider reliable. It consists in carbonizing about 100 grammes of the material in platinum, extracting the ash with strong hydrochloric acid, filtering through an acid-washed filter into a porcelain dish and washing the filter with hot water into this solu-

tion. The insoluble residue is treated with a few drops of strong nitric acid, dried and ignited. The ignited mass is treated with strong hydrochloric acid, and the filtrate added to the first solution, which, after concentrating to about 30 c.c. to 40 c.c., is placed in a weighed platinum dish and the copper precipitated with pure zinc. If the copper, after weighing, has not a pure color, it is dissolved in a little nitric acid, made up to a known quantity and determined colorimetrically in an ammoniacal solution.

In this way the following results were obtained:

	Parts of Copper in 10,000 of the Substance.
Oysters:	
Portuguese	2·94
Whitstable	1·81
Dutch	1·81
Plymouth	3·03
Cocoa:	
Pure cocoa (free from husk)	0·47
Cocoa containing sugar and starch	0·58
Brandy:	
Sample No. 1	0·05
" " 2	0·01
" " 3	0·04
" " 4	0·01
Whisky	0·04
Preserved Peas:	
Sample No. 1	1·44
" " 2	1·14
" " 3	1·10
" " 4	0·57
" " 5	0·54
" " 6	1·40
" " 7	0·95
" " 8	0·95
" " 9	1·25
" " 10	0·95
" " 11	0·70

These results and others show that the amount of copper in preserved peas varies considerably. Some of the samples were guaranteed not to have been treated with a copper salt.

Some results obtained by Vedrödi's method are here appended for comparison:

	Parts of Copper in 10,000 of the Substance.	
	Min.	Max.
Winter wheat	2·5	8·6
Summer wheat	2·5	3·0
Barley	0·1	0·9
Linseed	1·4	1·9
Peas	0·9	1·5
Mustard seed	0·9	1·0

The authors conclude that, according to Vedrödi, there is more copper naturally present in many vegetable substances than is found in vegetables to which it has been added to preserve their color.

ON THE CHEMISTRY OF HONEY.

Messrs. O. Künnmann and A. Hilger, in the *Forschungs-Berichte*, p. 211, for July, 1896, have published the results of a very elaborate investigation of honey. The pains they have taken in executing the details, and the care that was exercised in securing absolutely pure material, make the investigation a model of research. Their work was chiefly confined to the detection of dextrin. Many workers have found dextrin in some honey, but these careful workers have shown that dextrin is present in all honey, whether dextro-rotatory or lævo-rotatory. Nor is this all; they have even identified it as achroo-dextrin. The reason that others have failed to find dextrin in honey was because they employed contaminated fermenting agents.

ON THE DETERMINATION OF CAFFEINE IN TEA.

A. Petit and P. Terrat (*Jour. de Pharm. et de Chim.*, (6) **3**, 529) have published the results of their investigation on the use of magnesia and lime in this assay process. Their experience is similar to that already reported by Paul and Cownley,[1] namely, that magnesia and lime, either together or separately, retard the extraction of the alkaloid by chloroform.

As pointed out by Petit and Legrip,[2] chloroform alone will thoroughly exhaust tea of its alkaloid, if a small amount of moisture be present. The addition of ammonia does not increase the yield.

[1] *Pharmaceutical Journal and Trans.*, (3) **18**, 417, and **21**, 882.

[2] *Bull. de la Soc. Chim.*, 1877, p. 290.

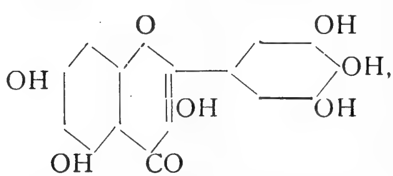
To demonstrate the action of water in assisting the action of chloroform, the authors give the results of a number of assays of tea which contained 2·50 per cent. of alkaloid, as follows:

Process Employed.	Per Cent. obtained.
Dry tea extracted by anhydrous chloroform	0·18
" " hydrated "	0·32
" " boiling "	0·48
Moist tea extracted by chloroform (process of Petit and Legrip),	2·50
Process of Grandval and Lajoux, dry tea and ammonia	2·44
Commaille's process — After completely drying the mixture	0·30
Commaille's process — The mixture being slightly moist	1·20
Commaille's process — The mixture being very moist	2·50
Tea treated with boiling water, dried, then extracted with chloroform	0·20
Tea treated with boiling water, dried, then moistened and extracted with chloroform	2·50
Tea, lime and water, having the consistence of paste, dried and then extracted with chloroform	0·80
Tea, lime and water, dried, then moistened with water and extracted with chloroform	2·47
Tea dried and extracted with alcohol of 98°	0·88
" " " " 80°	2·38
" " " " 60°	2·36
Tea and magnesia extracted by alcohol of 98°	0·76
" " " " 80°	2·34
" " " " 60°	2·38
1 gramme dried caffeine and 4 grammes of slaked lime, mixed to a paste with water, dried and extracted with chloroform	99·7
1 gramme dried caffeine and 4 grammes of calcined magnesia, mixed to a paste with water, dried and extracted with chloroform	99·8

The authors conclude from their experiments that magnesia and lime do not combine with caffeine in Commaille's process, that their presence in the assay process is useless, and that the following method of Petit and Legrip is the most satisfactory: 25 grammes of pulverized tea are mixed with three times their weight of boiling water, and allowed to remain in contact, with frequent agitation, for a quarter of an hour. The mixture is evaporated on a water bath until it is just moist, it is then placed in a percolator and exhausted with chloroform. The solvent is distilled, the residue is dissolved in hot water, passed through moistened filter paper and evaporated on a water bath to dryness. The product is usually sufficiently pure to weigh. The process is equally valuable for the estimation of caffeine in coffee, kola, maté and guarana.

ON THE COLORING MATTER CONTAINED IN THE BARK OF MYRICA NAGI.

Perkin and Hummel (*Proc. Chem. Society*, 1896, p. 145) have described the coloring matter contained in the bark of Myrica nagi. This plant is an evergreen tree belonging to the Myricaceæ, occurring in the sub-tropical Himalayas, in the Khasia Mountains, the Malay Islands and Japan. The bark, which is used as a tanning agent, and occasionally for medicinal purposes, contains a yellow coloring matter. This forms yellow needles, closely resembling quercetin, having the formula $C_{15}H_{10}O_8$. and yielding compounds with mineral acids, $C_{15}H_{10}O_8H_2SO_4$, $C_{15}H_{10}O_8HBr$, $C_{15}H_{10}O_8HCl$ and $C_{15}H_{10}O_8HI$, orange to orange-red needles, decomposed by water into the free acid and coloring matter. In strong solutions of alkali it dissolves with an orange color, which, on dilution and exposure to air, becomes first green, then deep blue, and finally red-violet. It dyes shades which, in their general character, closely resemble those produced by quercetin and fisetin. The acetyl derivative, $C_{15}H_4O_8(C_2H_3O)_6$, colorless needles, melting point 203–204°, and the benzoyl compound, $C_{15}H_4O_8(C_7H_5O)_6$, melting point, 233–236°, are described. With fused alkali it yields phloroglucol and gallic acid, and with bromine a compound (orange-brown needles, melting point 235–240°), the analytical numbers for which agree with the formula $C_{15}H_6O_8Br_4$. This is probably a tetrabromo-derivative of the coloring matter, but on account of its somewhat peculiar properties it will require further examination. The results of this investigation show that this coloring matter, for which the name myricetin is proposed, is most probably an hydroxy-quercetin,



and experiments with its alkyl ethers will be carried out to confirm this point. Its color reactions with dilute alkali are probably due to the oxidation of the pyrogallol nucleus it contains. The amount of coloring matter isolated by the method described varies from ·23 to ·27 per cent., and the amount of tannin it contains, estimated under the direction of Mr. H. H. Procter, Lecturer on Leather Industries, Yorkshire College, is 27·30 per cent.

THE ACTION OF METHYL ALCOHOL ON ACONITINE. FORMATION OF METHYL BENZACONINE.

Dunstan, Tickle and Jackson (*Proc. Chem. Society*, 1896, p. 159) state that when aconitine (or a salt) is heated with methyl alcohol in a closed tube, between 120° and 130°, the alkaloid loses one molecular proportion of acetic acid and takes up one methyl group, forming methyl benzaconine,

$$C_{33}H_{45}NO_{12} + CH_3OH = C_{32}H_{45}NO_{11} + CH_3COOH.$$

The authors have ascertained the composition of the new base by combustion, and have verified the same by estimation of the quantity of acetic acid separated in its production from aconitine by estimation of the amount of benzoic acid separated on hydrolysis, and also by determination of the number of methoxyl groups present, which shows that the base contains one more group than aconitine.

Methyl benzaconine is a well-crystallized base (melting point 210–211° corr.) soluble in alcohol, ether and benzene, and most readily crystallized by adding light petroleum to its ethereal solution. It forms crystalline salts, the hydrochloride and the hydrobromide being examples. On hydrolysis, methyl benzaconine loses benzoic acid, forming a base which appears to be methyl aconine, but which needs to be more completely investigated.

Methyl benzaconine produces a well-marked physiological effect when administered to animals; but, unlike aconitine, it is not a powerful poison.

ON ATISINE, THE ALKALOID OF ACONITUM HETEROPHYLLUM.

Jowett (*Proc. Chem. Soc.*, 1896, p. 158) has investigated the nature and properties of the alkaloid contained in the roots of the non-toxic Aconitum heterophyllum. This alkaloid was examined by Broughton in 1873, who named it atisine, and ascribed to it the formula $C_{46}H_{74}N_2O_5$; it was subsequently examined by Wasowicz and by Alder Wright.

The powdered roots were extracted by percolation with a mixture of methyl and amyl alcohol, and from this percolate was obtained the crystalline hydrochloride or hydriodide by a method described in the paper.

Atisine, for which the author adopted the formula $C_{22}H_{31}NO_2$, could only be obtained as a colorless varnish, soluble in alcohol, ether and chloroform, slightly soluble in water and insoluble in petroleum ether. Its alcoholic solution was lævo-rotatory $[\alpha]\,d = -19{\cdot}6^\circ$, and though the base was amorphous it yielded a series of crystalline salts.

Atisine hydrochloride, $C_{22}H_{31}NO_2HCl$, crystallized either from water or from a mixture of alcohol and ether in well-defined prisms, which melted at 296° (corr.), and were freely soluble in water or alcohol, but insoluble in ether. The aqueous solution of the salt was dextro-rotatory $[\alpha]\,d = +18{\cdot}46^\circ$.

Atisine hydrobromide, $C_{22}H_{31}NO_2HBr$, crystallized from water or a mixture of alcohol and ether, either singly or in rosettes of needles, which melted at 273° (corr.). The salt was freely soluble in water and alcohol, but insoluble in ether or petroleum ether, and in aqueous solution it was dextro-rotatory $[\alpha]\,d = +24{\cdot}3^\circ$.

Atisine hydriodide, $C_{22}H_{31}NO_2HI$, crystallized from hot water or alcohol in well-defined plates or tables, melting at 279–280° (corr.), soluble in hot water or alcohol, but sparingly soluble in cold water. Its aqueous solution was dextro-rotatory $[\alpha]\,d = 27{\cdot}4^\circ$. This salt could not apparently be prepared by the direct action of hydrogen iodide upon the base, but was easily prepared by precipitating a solution of any salt of atisine with potassio-mercuric iodide, and decomposing the precipitate with hydrogen sulphide.

The nitrate (melting point 252° corr.) and platinichloride (melting point 229° corr.) were also obtained as well-defined crystalline salts, but the auri-chloride could only be obtained as an amorphous powder. The results of the analyses of a number of pure salts led to the adoption of the formula $C_{22}H_{31}NO_2$ for the base.

The alkaloid was shown to contain no methoxyl groups.

When either the base or its salts were mixed with alkalis or acids in either alcoholic or aqueous solution, no fission of the molecule took place, but a new base, atisine monohydrate, $C_{22}H_{31}NO_2H_2O$, was formed. Neither this base nor any of its salts could be obtained in the crystalline condition, but analyses of the auri-chloride and platinichloride confirmed the formula given above.

A preliminary examination of the physiological action of the nitrate, by Dr. Cash, F.R.S., showed that the alkaloid is non-toxic, and that its action somewhat resembles aconine.

CORRESPONDENCE.

Editor of AMERICAN JOURNAL OF PHARMACY.

DEAR SIR :—The following may possibly have some bearing on the subject of Professor Caspari's paper in the AMERICAN JOURNAL OF PHARMACY for September, that alcohol is not indifferent to indicators.

In *Apotheker Zeitung*, 1895, p. 48, Salzer explains the apparent alkalinity of alcohol (turning an as much as possible neutral solution of litmus of a wine-red color, blue) by stating that the wine-red color is due to dissolved carbonic acid gas, which is dispelled from the solution on the same principle that air is dispelled from water on mixing with alcohol. One drop of such a litmus solution added to 2-3 c.c. of alcohol shows this plainly.

Another observation may have some bearing, too. Allen (*Analyst*, 1896, p. 86, or *Chem. and Drug.*, 1896, p. 22) calls attention to the fact that ordinary quinine is practically neutral to brazil wood, cochineal and logwood, but rather strongly alkaline to methyl-orange. To litmus it is distinctly alkaline ($Qu_2H_2SO_4$). On the other hand, bisulphate is neutral to methyl-orange.

He, therefore, advises that chemists should be particular in the use of indicators.

Yours truly, HANS M. WILDER.

BAYONNE, N. J., September 5, 1896.

Editor of AMERICAN JOURNAL OF PHARMACY.

DEAR SIR :—The firm of Evans & Sons, of Boston, Mass., having read my article on "Gelatine Capsules," as printed in the AMERICAN JOURNAL OF PHARMACY, asked me to correct the erroneous statement that their capsules—the so-called "Savaresse's capsules"—were short-lived, as stated therein. The fact is that, while the first capsules were not a great success, improvements were soon made in their manufacture, and their sale has continued till to-day. The error got into the manuscript by cutting down a long description of these capsules to a few lines, and was not discovered in time to alter the reprint as presented at the Montreal meeting.

As Evans & Sons think that an injustice has been done them, I hereby take occasion to correct the error. I remain,

Yours truly, WILLIAM C. ALPERS.

EDITORIAL.

MODERN DIETETICS.

The science of food is always a much-abused subject, but the year 1896 has been especially fruitful in this abuse. One of the most startling contributions was read at a meeting of the American Medical Association, at Atlanta, in May, on the subject of "Lycopersicum cardiopathia." According to the author, the tomato, Lycopersicum esculentum, is to be regarded as a diluent and not as a food. Concerning its composition he says: "The fluid element has been found to consist of an acid called *acidum lycopersicum*. Others have claimed the acids to be acetic and malic in combination."

Now, as a matter of fact, lycopersic acid is of doubtful existence, and acetic and malic acids do not exist in combination with each other; and, so far as known, only one of them, malic acid, occurs in the tomato. That, however, is apparently of secondary importance, for we next read that, "notwithstanding the almost universal indulgence in this fruit, there is a certain proportion to whom it acts as a poison. In some the symptoms are gradually developed; in others they become immediately alarming. Some cases show no immediate evidences, but the results are cumulative." The writer then proceeds to depict the dreadful symptoms which accompany the use of the tomato as a food, in a manner that would do credit to a newspaper reporter of long experience in "writing up" a case of hydrophobia. No one who reads the paper and believes it, will ever venture to touch the luscious tomato again.

Notwithstanding the fact that the learned doctor has had an experience of fifteen years in observing this frightful disease, we could take him into districts where, for two or three months of the year, the inhabitants depend largely on the tomato as an article of food, and we feel sure they know nothing about "lowered alkalescence of the blood" or "myocardial weariness." "The irregular and spasmodic stimulation of the ganglionic cells" is a matter of indifference to them, provided they get a good price for their tomatoes and have enough of them to eat. They grow fat and are happy.

Just what the author expected to accomplish by such a startling announcement it is difficult to conceive. If it was to get into the newspapers, he succeeded; for "penny-dreadful" paragraphs from his home papers are now going the rounds of the press, and it is wearying to think of the infinitely distorted forms under which this misinformation will appear.

It is gratifying to note that all the other members at the meeting apparently did not take the doctor seriously, for one suggested that we would soon hear of carrot heart, potato heart and onion breath, and he doubted whether we will ever be able to make a list of vegetables that we may eat with safety. Another member suggested that the symptoms which had been so vividly described might all be caused by "wind on the stomach."

Food adulteration is another department of modern dietetics which is frequently most intemperately treated. One of the latest comes from the Pacific Coast, in the shape of a paper read before the California Medical Society. This author makes such a sweeping statement of adulteration in coffee, tea, eggs (artificially prepared), milk, butter, sugar, honey and alcoholic beverages, as to leave no avenue of escape for a nervous person or an invalid. He holds out one ray of hope in regard to spices by admitting that "the better brands appear

to be pure." The fact is that the better brands of nearly every food are free from adulteration, and usually the same may be said of the medium brands. No cause has ever been helped by exaggeration, and that of pure food has been almost hopelessly retarded by the unqualified assertions of those who write about it rather than work in it, and who well know the public ear is always alert to hear about food adulteration.

The latest contribution on the subject of modern dietetics comes from a beef-packing house in Chicago. It is in the form of a circular, and calls attention to an article in the *Scientific American Supplement* on "Oleomargarine and Wasting Diseases." The author of this contribution is an M.D., as were those of the papers already commented upon. We learn from the circular that this doctor is a contributor to the *Scientific American*, "of long standing and of very high reputation." The reason for the beef company sending this article broadcast is evident. Why the doctor should have written such an article, or the *Scientific American* should have published it, is not so evident, although we do not believe it will be necessary to apply Roentgen rays to see the cause without the evidence.

This paper states that cod-liver oil has nothing magical about it. "Save as an easily digested fat, it is valueless." This is hard on those who are continually calling attention to the magical alkaloids of cod-liver oil, and throwing away the fat. We are next told that butter is essential in every-day life and its free use is to be encouraged, "but unfortunately an excess of butter diet, even in a healthy organism, is apt to give rise to butyric dyspepsia, and butyric fermentation is set up largely through the presence of a ferment—a residuum left by the buttermilk." Having now reached a point where some death-dealing bacilli are sure to carry us off, we read on with some anxiety and find that one means of deliverance has been left, namely, we are to eat oleomargarine and plenty of it. It has been necessary to go all the way to Austria to find this out. Jollies and Winkler, "official chemists for the Austrian Government," have published the results of their research in the *Zeitschrift für Hygiene*, and they find "that the only germs ever present in 'oleo' are the varieties common to air and water." The dairy product, however, is especially liable to contamination. We would like to believe all this fairy tale, it is so ingeniously gotten up, but reason rebels.

THE METRIC SYSTEM OF WEIGHTS AND MEASURES.

The special committee of the American Pharmaceutical Association to further the adoption of the metric system in the United States gave evidence in the report presented at Montreal of having been actively engaged during the year, but nothing more than progress could be reported by them. It has been found that there is much quiet opposition to the adoption of this system, which opposition we believe is inspired by ignorance. A short time ago there appeared in a Philadelphia daily newspaper an article favorable to the metric system, and in order to advance the cause elaborate tables of equivalents in the English and metric systems were given. Now it is just this matter of comparison that frightens the public. When a man reads that a meter is equivalent to 39·37 inches, and that a gramme is 15·4324 grains, he naturally concludes that he can never take the time to bother with it. The way to adopt the metric system is to first get

the weights and measures, and say nothing about any system but the one which is to be adopted. If we want to measure a litre of alcohol it is just as easy to do it if we have the proper vessel as it is to measure a pint or a quart with the vessels now in use. It then becomes of no more value for one to know what a litre is in pints than it is to know what our dollar is worth in shillings. The writer's experience with students who wish to learn the metric system is that ten minutes with a set of metric weights, a balance and something to weigh will put them in a position to learn the system themselves in less than an hour; in fact, it frequently dawns on them at once when they are placed before a balance with a set of metric weights that they have no use to know the value of these weights in grains or ounces. Tables of equivalents have their use just now, but when the new system has once been adopted these tables will only be of value in trading with such countries as do not use it, and if this country does not move faster in the matter we will be the last to abandon the tables.

THE LAVOISIER MONUMENT.

The following circular has just been issued by the American Committee, and is self-explanatory:

"A century has elapsed since the judicial murder of Lavoisier under the reign of terror. The rapid progress of science during the century has made the fundamental importance of the work of Lavoisier universally recognized.

"The centenary of his tragic death has reminded chemists in many lands of their debt to the memory of Lavoisier. Accordingly, a monument will be erected to Lavoisier, at Paris, under the auspices of the Academy of Sciences of Paris.

"Large sums have already been subscribed for this purpose in France, and subscriptions are progressing in Germany also. The American Lavoisier Committee, the first of all organized, has deemed it prudent to defer active work until the present.

"We admit that chemists are more numerous in other countries, but the proverbial liberality of Americans will make it difficult to crowd us to the rear, especially as our manufacturing chemists are interested as much in the work of Lavoisier as are the physical and general chemists.

"Besides, a monument to Lavoisier should not interest the chemists only, for other branches of science are greatly indebted to the founder of the Chemistry of the Elements, the investigator of the process of combustion in all its forms. Astronomers gratefully remember his co-operation with Laplace, his work in the establishment of the metric system and the determination of its units, sustaining the field work of triangulation by his money, and measuring and weighing with Hauy in his laboratory till ruthlessly thrown into prison. Physicists begin their exposition of the measurement of heat by the description of the first calorimeter and the work done therewith—all by Lavoisier. Experimental physiology also began in the laboratory of Lavoisier, with his experiments on respiration at rest and under external mechanical work. Mineralogists and geologists have not forgotten that the first personal work of young Lavoisier was the beginning of the geological map of France, the first map of that kind ever made.

"But while our first appeal properly is addressed to the chemists and other scientists of this country, we are convinced that the enlightened general public of the United States will consider it a privilege to contribute to the Lavoisier monument. The immense territory west of our great river was French at the time when Lavoisier was engaged in his immortal researches. While this country was feeble, and struggling for liberty against unheard-of odds, our own Benjamin Franklin found in the house of Lavoisier a circle of friends contributing to bring about that alliance with France which before Yorktown made our independence a reality, and forever linked the name of Lafayette with that of Washington in the hearts of Americans. Recently French citizens have marked the entrance to our greatest harbor by the grandest and most unique statue of the world. For these reasons our people will be glad of the opportunity now presented to reciprocate by contributing to the monument that is to mark the blood of one of the noblest of our race, shed by temporary rulers of France, tauntingly declaring 'the Republic has no use for scientists.'

"Subscriptions to the Lavoisier monument will be received by each of the undersigned members of American Lavoisier Committee. Every subscription will be promptly acknowledged by a formal souvenir receipt, bearing the portrait of Lavoisier in prison. The sums collected will, at intervals, be transmitted to the Treasurer of the "Souscription Lavoisier" of the Academy of Sciences of Paris. A complete report of all subscriptions will be published at the close of this work and sent to each subscriber. The original individual subscription papers will be bound and deposited in the Archives of the Academy. The monument is expected to be completed by the opening of the Exposition in 1900, but this Committee desires to close its work two years before that time.

"In conclusion, we ask leave to state that all expenses of every kind connected with this canvass for subscriptions are met by the Committee, each member paying all expenses he individually incurs in this work, so that every dollar subscribed will reach Paris in full, and contribute to the erection of the Lavoisier monument, which, in the words of Dumas, 'to posterity shall express our profound admiration for his genius and our lasting sorrow for his untimely death.'

"Jasper L. Beeson, A.M., Ph.D., Professor of Chemistry in the Audubon Sugar School; Research Chemist for the Louisiana Sugar Experiment Station, etc., New Orleans, La.

"Charles Anthony Goessmann, Ph.D., LL.D., Professor of Chemistry at the Massachusetts Agricultural College; Chemist of the Hatch Experiment Station of the College; Chemist of the Massachusetts State Board of Agriculture, etc., Amherst, Mass.

"Eugene W. Hilgard, Ph.D., LL.D., Professor of Agricultural Chemistry in the University of California; Director of the California Experiment Station, Berkeley, Cal.

"Richard Watson Jones, M.A., LL.D., Professor of Chemistry in the University of Mississippi, University, Miss.

"John Uri Lloyd, Professor of Chemistry in the Eclectic Medical Institute of Cincinnati; President (1887) of the American Pharmaceutical Association, Cincinnati, O.

"John H. Long, M.S., Sc.D., Professor of Chemistry and Director of the Chemical Laboratories of the Schools of Medicine and Pharmacy of Northwestern University, 2421 Dearborn Street, Chicago, Ill.

"John Ulric Nef, Ph.D., Professor of Chemistry and Director of the Kent Chemical Laboratory of the University of Chicago, Chicago, Ill.

"James Marion Pickel, A.M., Ph.D., Professor of Chemistry in the University of Alabama, University, Ala.

"Paul Schweitzer, Ph.D., Professor of Agricultural Chemistry and Chemist to the Agricultural Experiment Station, University of the State of Missouri, Columbia, Mo.

"William Simon, Ph.D., M.D., Professor of Chemistry in the College of Physicians and Surgeons of Baltimore, in the Maryland College of Pharmacy and in the Baltimore College of Dental Surgery, 1348 Block Street, Baltimore, Md.

"Edgar F. Smith, Ph.D., Professor of Chemistry in the University of Pennsylvania; Director of the John Harrison Laboratory of Chemistry; President (for 1895) of the American Chemical Society, Philadelphia, Pa.

"Eugene Allen Smith, Ph.D., State Geologist of Alabama; formerly Professor of Chemistry, now of Mineralogy and Geology, in the State University of Alabama, University, Ala.

"Henry Trimble, A.M., Ph.M., Professor of Analytical Chemistry in the Philadelphia College of Pharmacy; editor of the American Journal of Pharmacy, 145 North Tenth Street, Philadelphia, Pa.

"Francis Preston Venable, Ph.D., Professor of Chemistry in the University of North Carolina; Secretary (for 1896) of the Chemical Section of the American Association for the Advancement of Science, Chapel Hill, N. C.

"Gustavus Detlef Hinrichs, M.D., LL.D., Professor of Chemistry St. Louis College of Pharmacy; Delegate of the Academy of Sciences, of Paris, for the United States, 3132 Lafayette Avenue, St. Louis, Mo."

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

The Standard Formulary. A collection of over four thousand formulas. By Albert E. Ebert, Ph.M., Ph.D., and A. Emil Hiss, Ph.G. Chicago: G. P. Engelhard & Co. 1896.

The authors announce in their introductory that "pharmacists who possess formulas of merit cling to them with the greatest tenacity, this being one feature which has assisted in fostering the 'specialty' or proprietary medicine industry—the bane of pharmacy to-day." Nothing will help to drive nostrums from the pharmacist's shelves faster than the wide distribution of formulas, except, perhaps, the absence of profit.

The National Formulary has done much to awaken the pharmacist to the fact that he can compound as good remedies as the manufacturer. Now, the Standard Formulary will advance him one step further, and, by calling various household and proprietary remedies by their right names, will show him that he may make the same and reap the profit which belongs to him.

Part I embraces what are commonly known as pharmaceutical preparations, and contains selections from the various Pharmacopœias, the Eclectic Dispensa-

tory, the National Formulary, and other authoritative works. Part II is devoted to household remedies. Part III gives the formulas of proprietary preparations, and cannot but remove the magic which surrounds many of the well-known nostrums of the present day. Part IV includes veterinary preparations. Part V, toilet preparations. Part VI, soda-water requisites, and Part VII, miscellaneous.

Much care has been exercised in constructing the various formulas, so as to adapt them to the preparations which are kept in stock in this country. We regret that it has not been adapted to the metric system ; but we presume the authors had in mind that class of pharmacists who are least likely to use the metric system, and are, therefore, most in need of just such information as is contained in this book.

We predict for the work a wide circulation, for it deserves it.

PTOMAÏNS, LEUCOMAÏNS, TOXINS AND ANTITOXINS, or The Chemical Factors in the Causation of Disease. By Victor C. Vaughan, Ph.D., M.D., and Frederick G. Novy, Sc.D., M.D. Third edition, revised and enlarged. Lea Bros. & Co., Philadelphia and New York. 1896.

We are told by the authors that "it is now generally recognized that those diseases which cause the greatest mortality and, consequently, are of the greatest importance, are in reality cases of poisoning. * * * Not only are there chemical factors in the causation of disease, but specific chemical agents are now being employed in the prevention and cure of disease."

It will be seen, therefore, that this work is a necessity to both chemist and physician.

Every part of the book is interesting ; but one is naturally impressed by the chapter on the history of bacterial poisons, in which the very few investigations reported a century ago gradually led on to others, until, in the decade from 1880 to 1890, the well-known discoveries came thick and fast, including that of tyrotoxicon, by Vaughan. From 1890 to the present, still more rapid progress has been made, and the outcome has been diphtheria antitoxin, as well as a number of other substances of analogous character, which give promise of being valuable.

The foods liable to contain bacterial poisons are enumerated, and a chapter is devoted to the methods used in their examination. Another chapter is devoted to Immunity, Antitoxins and Serum Therapy. As the title of the book indicates, the ptomaïns and leucomaïns receive due consideration. In the face of such a large amount of material, and the almost unlimited and unexplored field which this subject leads into, the least that can be said is that every one who has to do with chemistry and toxicology should study the 600 pages which make up this book.

CANAIGRE. By Robert H. Forbes. Bulletin No. 21 of the Arizona Agricultural Experiment Station, University of Arizona, Tucson. July, 1896.

The literature of Canaigre, Rumex hymenosepalus, is not very extensive. Some of the first notices of it have appeared in this Journal. At the present day the root of canaigre is considerably used in the manufacture of leather, and is cultivated for the purpose. The original idea that there was sufficient of it growing wild in Arizona and New Mexico to

supply an enormous demand has been shown to be incorrect, and it has thus far been difficult to produce it rapidly enough to furnish a certain supply.

This Bulletin is the second issued on this subject by this Station, and others have been issued by the Experiment Stations of New Mexico, California and Florida. The plant will grow in almost any climate, but it appears to be especially adapted to the arid Southwest. Professor Forbes has gone into the subject very thoroughly, and given us a very interesting contribution to the various phases of this promising material.

THE ENERGY OF LIVING PROTOPLASM. By Oscar Loew, Ph.D. London: Kegan Paul, Trench, Trübner & Co., 1896. Pp. 115.

The appearance of Dr. Loew's contributions on this subject in one volume will be welcomed by all those who wish to study the origin or meaning of plant life.

Some of the chapters of this treatise, in a more or less abridged form, have already appeared in the *Bulletin* of the *Agricultural College of the Imperial University*, Japan, and have been noticed in the AMERICAN JOURNAL OF PHARMACY (1894, p. 412, and 1895, pp. 179 and 638).

In the work as now published, the author is prepared to express some conclusions, or, as he puts it, he waives all speculation and presents them as facts. We think he has made a masterly presentation of the results of his investigations, although every one will admit that he set for himself a hard task when he undertook to explain the nature of the so-called vital energy. The conclusions are summed up as follows: "A great activity, in the form of oscillations of certain atoms in labile position exists in the proteids of living protoplasm, and that this ever active chemical energy, leading to respiration, and in turn intensified by it, is especially well adapted to do chemical work, since atoms can be set in motion by others already in motion, just as molecular motion (heat) can be imparted to other molecules, *i. e.*, conveyed by impact. The peculiar mode of motion in the labile proteids is also the source of vital activity. This energy is the necessary link in the chain of constructive and destructive metabolism. It must, on the one hand, help radiant energy to construct carbohydrates from carbonic acid in green plants, and on the other lend its aid to burn up carbohydrates, fats, and amido-acids in the respiration process. However, not only the potential energy of the thermogenes, but also the kinetic energy of the labile proteids composing the living protoplasm, is, in the long run, but one of the vicissitudes of solar energy."

DEPARTMENT OF AGRICULTURE, CENTRAL EXPERIMENTAL FARM. FLAX. Bulletin No. 25. Ottawa, Canada. May, 1896.

This pamphlet gives statistics concerning the cultivation of flax in the United States and Canada. In the province of Manitoba and in the Northwestern section (the principal area devoted to its cultivation) of the United States the crop is grown almost entirely for its seed, the fibre, owing to climatic conditions, being of inferior quality. The crop in the United States in 1894 amounted to about 7,500,000 bushels, and the price ranged from $1.40 to $1.50 per bushel. In 1895 the area under cultivation was much increased, and the yield was estimated at 19,000,000 bushels, which brought the price down to from 90 cents to $1 per bushel.

THE EMINENTLY SCIENTIFIC NATURE OF OUR PATENT AND COPYRIGHT LAWS. By F. E. Stewart, M.D., Ph.G. Reprinted from the *Journal of the American Medical Association*, August 22, 1896.

This is an interesting summary of the subject, and the author calls on the American Medical Association to do something instead of taking a middle course, as at present.

SOME NEW SOUTH WALES PLANTS WORTH CULTIVATING FOR SHADE, ORNAMENTAL AND OTHER PURPOSES. By J. H. Maiden. Pp. 39. Government Printer, Sydney. 1896.

COMPOUNDS WHICH COMPLICATE THE ESTIMATION OF SUGAR IN URINE. By Henry C. C. Maisch, Ph.G., Ph.D. Reprint from *Codex Medicus*. July, 1896.

EXPERIMENT STATION RECORD. Vol. 7, No. 9. U. S. Department of Agriculture, Washington, D. C.

The most notable article in this number is "The Pathology of Plants : Lines of Investigation that might be Undertaken by Experiment Stations," by B. T. Galloway.

INDEX CATALOGUE OF THE LIBRARY OF THE SURGEON-GENERAL'S OFFICE, U. S. ARMY. Vol. I. Second series, A to Azzurri. Government Printing Office, Washington, D. C. 1896.

TEXTURE OF SOME IMPORTANT SOIL FORMATIONS. U. S. Department of Agriculture. Bulletin No. 5. Washington. 1896. Illustrated.

NUT CULTURE. By H. M. Engle. U. S. Department of Agriculture. Circular No. 1. Washington. 1896.

ANNUAL ANNOUNCEMENT AND REGISTER OF ALUMNI OF THE SCHOOL OF PHARMACY, UNIVERSITY OF MICHIGAN. Twenty-ninth Year. Ann Arbor. 1896–97.

THE BROOKLYN COLLEGE OF PHARMACY. Sixth Annual Announcement. Session of 1896–97.

TWENTY-SIXTH ANNUAL ANNOUNCEMENT OF THE LOUISVILLE COLLEGE OF PHARMACY. Session of 1896–97.

UNIVERSITY OF WASHINGTON. Catalogue for 1895–96, and Announcements for 1896–97. Olympia, Wash.

ALBANY MEDICAL COLLEGE. Catalogue for 1895–96, and Announcement for 1896–97. Albany, N. Y.

FIFTY-SEVENTH ANNUAL CATALOGUE OF THE BALTIMORE COLLEGE OF DENTAL SURGERY. Baltimore, Md. 1896–97.

CENTRAL TENNESSEE COLLEGE. MEHARRY MEDICAL, DENTAL AND PHARMACEUTICAL DEPARTMENTS. Catalogue of 1895–96, and Announcement for 1896–97. Nashville, Tenn.

REPORT OF THE BOARD OF MANAGERS OF THE PENNSYLVANIA HOSPITAL. 1896.

UEBER SCOPOLAMIN UND ATROSCIN. Von O. Hesse. Reprint from *Berichte der Deutschen Chemischen Gesellschaft.* Vol. 29, No. 11. Berlin. 1896.

ZUR KENNTNISS DES HYOSCINS. Von O. Hesse. Reprint from *Berichte der Deutschen Chemischen Gesellschaft.* Vol. 29, No. 11. Berlin. 1896.

EXPERIMENTAL FARMS. Reports to the Minister of Agriculture, Ottawa, Canada, 1896. William Saunders, Director. Pp. 426.

TWENTY-NINTH ANNUAL ANNOUNCEMENT OF THE MONTREAL COLLEGE OF PHARMACY. Session 1896–1897.

TWENTY-SIXTH ANNUAL ANNOUNCEMENT LOUISVILLE COLLEGE OF PHARMACY. Session of 1896–1897.

ELEVENTH ANNUAL ANNOUNCEMENT BUFFALO COLLEGE OF PHARMACY. 1896–1897.

ST. LOUIS COLLEGE OF PHARMACY. ANNUAL ANNOUCEMENT FOR 1896–1897.

NOTES AND NEWS.

Mr. Gladstone, in a recent interview with some members of the British Pharmaceutical Conference, stated that he held two impressions in regard to their body. One was that during his lifetime there had been a very great advance in their profession, by increasing knowledge, and improving the education of those who conduct the chemist's business. It is really a wonderful thing, considering the millions and millions of prescriptions made up, that so very few mistakes occur. So far as he was concerned personally, he had never been the subject of such a mistake, although he had lived long enough to run the chance of it. His other impression was that chemists as a body are very united, for he remembered that about sixty years ago, some measure or other was introduced into the House of Commons, which affected chemists and druggists very materially, and he was much struck with the steady fire of opposition directed against the measure. Their resistance, so far as he could recollect, was entirely successful.

OBITUARY.

G. F. H. Markoe. Notice of the sudden death of Professor Markoe, of Boston, has just been received (September 25). He was alone in his laboratory and death is supposed to have been due to paralysis. He was about 60 years of age.

Isaac N. Coffee, of Cairo, Ill., President of the Illinois State Board of Pharmacy, was killed on his way to the train on July 27th, by Dr. Crabtree, a well-known druggist of the same place. Mr. Coffee's death was the result of an enmity of several years' standing, and, at the inquest the next day, the jury returned a verdict of unjustifiable homicide.

President Coffee was appointed to the Illinois State Board of Pharmacy in 1892. In 1871 he graduated from Transylvania University, Lexington, Ky., and in 1874 from the Philadelphia College of Pharmacy. Since 1883 he has been engaged in the drug business in Cairo.

THE AMERICAN
JOURNAL OF PHARMACY

NOVEMBER, 1896.

SENNA.

TO DISTINGUISH BETWEEN THE ALEXANDRIA AND INDIA VARIETIES IN POWDER, AND TO EXCLUDE POWDERED CHESTNUT LEAVES.

By L. E. Sayre,

Member of the Research Committee, of the Committee of Revision of the United States Pharmacopœia.

One of the problems presented to the members of the Research Committee is expressed by the title to this paper. The writer will endeavor to answer it as briefly as possible.

The two sennas, Alexandrian and Indian, in the powdered state, have many points of resemblance and few of diversity. In the whole state it is well known that a discrimination is readily made without the use of a lens or reagent. In the powdered state the task becomes more difficult. There are two points of difference that even a moderately acute observer will notice:

(1) The small number of plant hairs in one case and the much greater number in the other.

(2) In the dissimilarity of form of the epidermal cells. Both of these points of distinction will be referred to more at length.

(1) If equal amounts of the Alexandrian and Indian varieties in No. 60 powder be taken, it will be seen that there are about ten plant hairs of the former to one of the latter variety. If 25 milligrammes of the powdered sennas under examination be mixed with 5 c.c. of diluted alcohol, and one drop of the mixture be examined under the microscope, there will be found in the India senna from one to three of the plant hairs, and in the Alexandria variety from

eight or ten to twenty or more; the number in both cases varies of course.

On very close observation it will also be seen that the plant hairs in the Alexandrian senna have a sharp curve near the base, indicating that they are more or less appressed on the leaf, while in the Indian variety the hairs are shorter, straighter and stouter. The plant hairs almost invariably remain unbroken in the powder. Hence, from this we may reasonably expect an admixture of the two varieties in the powdered state to produce an effect recognizable

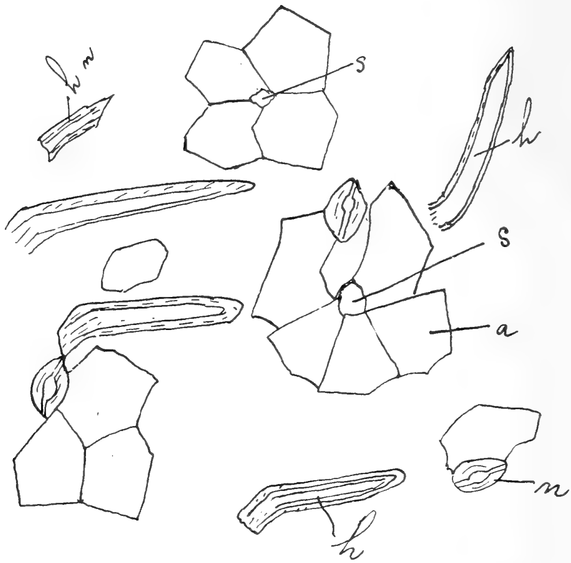


Fig. 1.—Alexandrian senna, about 260 diameters. *a*, ordinary epidermal cell; *n*, stoma; *h*, plant hairs; *hn*, broken fragment; *s*, scars.

to any one familiar with the appearance of these varieties under the microscope.

(2) Epidermal cells. The cell structure represented by the epidermal tissue seems also to be a recognizable one in the fine powder. In the Indian senna the epidermal cells are somewhat smaller and more uniform in size, and the angles more acute than in the Alexandrian variety. The second difference—epidermal cells—is not one that could be successfully employed, except by experts, perhaps, in distinguishing the powdered sennas ordinarily, or in detecting mixtures of the two.

Careful measurements of the epidermal cells in the two varieties give the following results:

India senna, average	35 micromillimetres in diameter.
Alexandria senna, average	40 " " "

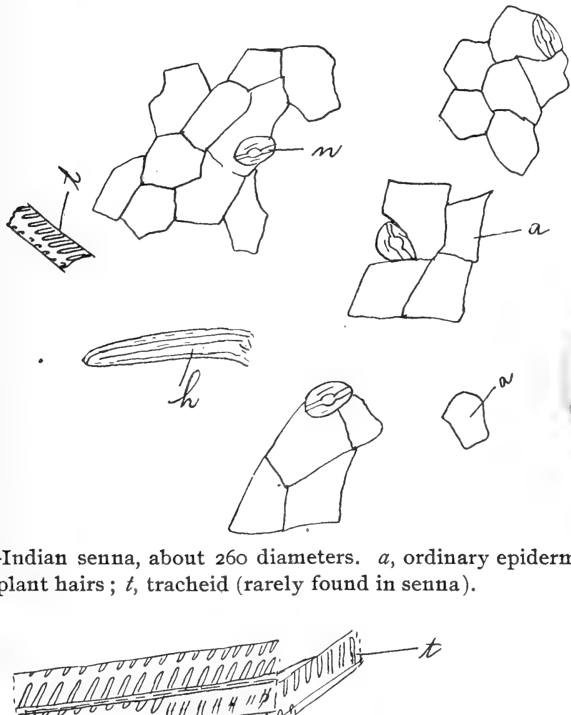


Fig. 2.—Indian senna, about 260 diameters. *a*, ordinary epidermal cell; *n*, stoma; *h*, plant hairs; *t*, tracheid (rarely found in senna).

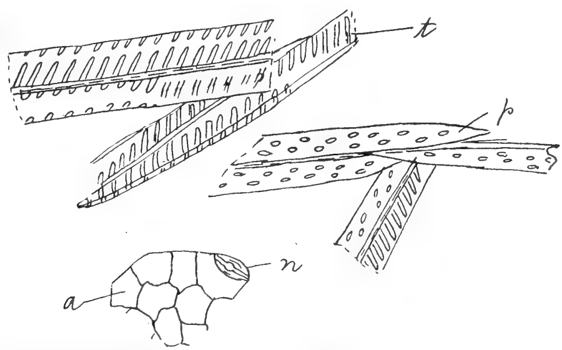


Fig. 3.—Chestnut leaves, about 260 diameters. *a*, ordinary epidermal cell; *n*, stoma; *p*, pitted cells from mid-rib; *t*, tracheids from mid-rib.

Chestnut Leaves.—The adulteration of senna with chestnut leaves in powdered form can readily be detected. Place ½ gramme of the No. 60 powder in a layer of uniform thickness on a clean glass slide,

and place this on a piece of clean white paper. Drop upon this one drop of a 5 per cent. solution of ferric chloride. The drop remains for some time in the form of a globule, unabsorbed. If senna alone be present, the powder as seen through the drop remains comparatively unchanged. If any chestnut leaves be present they will be shown by the particles under the drop in less than thirty seconds, turning a dark blue or black color (tannin). A very small per cent. of such an adulterant as chestnut leaves can thus be detected. The solution of ferric chloride should not remain on the powder more than one-half minute to give the most delicate reaction.

The epidermal cells of the chestnut leaves were found to average 25 micromillimetres in diameter.

Powdered senna, adulterated with chestnut leaves, may be examamined under a microscope and the adulteration detected by the presence of the tracheids and pitted cells which compose the midrib of the chestnut leaf. The finding of bundles of these fibres in senna powder is good evidence of adulteration. Occasionally, fragments of these wood cells may be found in senna powder, but they are rare.

A BOTANICAL EXCURSION TO MEXICO.

By John W. Harshberger.

Mexico is a profitable place for the botanist to visit, on account of the richness of the flora, numerically speaking, and because of the assemblage in one geographical region of many species peculiar to certain physical or meteorological zones. The aquatic flora, the alpine flora, the desert and tropical floras, are all found associated within a radius of a few miles. Altitude and the distribution of the rainfall explain this somewhat interesting feature of the flora. The problems presented to the botanist for solution are very intricate, and it is necessary for him, in order to solve the more difficult questions, to spend considerable time in the field, where the plants are to be found surrounded by natural conditions.

Each of the plant communities into which the flora of a country, as vast as Mexico, can be divided, can be distinguished by the component plants, which, together with their collective features, give character to the vegetation of a particular meteorological, geological or physical region of the earth's surface. Such a flora as the

Mexican can be classified into several ecological[1] communities, as follows:

(1) Hydrophytic Community, composed of Hydrophytes, or water-plants.

(2) Xerophytic Community, composed of Xerophytes, or desert-plants.

(3) Halophytic Community, composed of salt-loving plants.

(4) Mesophytic Community, including those plants found in intermediate situations, such as plants of the tropical forests, palm forests, bamboo thickets, temperate deciduous forests, sub-tropical evergreen forests, and plants of the arctic, alpine and prairie regions.

The Valley of Mexico is especially suited to ecological inquiries. It is an elevated circular valley, closed in by two distinct ranges of hills, the oldest porphyritic rocks to the north and east, which, before volcanic disturbances began, sloped gradually southward toward the Isthmus, and the newer volcanic mountains to the south and west, built up in a later period and closing off to the south and east the gradually sloping plain, thus forming the basin-shaped plateau known as the Valley of Mexico. Ajusco, the oldest volcanic peak, stands like a sentinel on the southern rim of the basin, and from its summit to the base of the valley extends a lava bed, known locally as the Pedregal. On the southeast rim of the Valley rises the ice-capped peak of Popocatepetl (17,780 feet), and to the eastward, connected with the conical volcano, the ridged back-bone of Ixtaccihuatl, also snow-capped, considered by geologists to be built of the older porphyritic rocks. Along the base of the eastern range three fresh-water lakes, Texcoco, Chalco and Xochimilcho, are found, while the partially drained basin of Lake Texcoco forms an alkaline plain, stretching along the Mexican Railroad to the hills, which jut southward into the plain at Guadalupe.

The lakes and communicating ditches furnish the hydrophytes; the alpine summits of Popocatepetl, Ixtaccihuatl and Ajusco (13,612 feet), the alpine plants; the lava beds afford a large number of xerophytes, while the alkali plain near Lake Texcoco grows a number of halophytes, which reach their greatest numerical devel-

[1] Ecology is the study of plants with reference to their environmental conditions, and covers the field of the so-called biology of plants.

opment on the Gulf Coast. The rich agricultural soil of the valley grows a varied and luxuriant series of mesophytes. It presents, in its constricted area, a veritable botanical garden, right at the doors of the population of the capital.

Space will not permit a detailed account of the plants found growing in the different vegetable zones. Only one or two plants can be taken by way of illustration. The xerophytes show very thick leaves, thick cuticle and a hairy or spiny covering, and are usually consolidated in structure. The plants are peculiarly constructed so as to store water by means of certain mucilaginous substances, which absorb moisture and hold it tenaciously, giving it off very slowly to the air. The agave, maguey, or century plant, commonly found cultivated on the plateau of Anahuac, is a typical xerophyte. It is to be seen growing wild in desert places and on lava beds, and grows in one or two forms to a large size (8 feet), weighing sometimes 600 to 800 pounds. It is a plant of considerable pharmaceutical interest. It stores up in its tissues a surprising amount of a sugary water, which exudes when the plant is tapped, as the so-called honey water, or aguamiel. This aguamiel, when fermented, yields the beverage called pulqué, which is consumed in large quantities by the poorer Mexicans, who pay *una quatrillo* (3 cents Mexican, 1½ cents American) for a glass of this yeasty-tasting alcoholic drink. It is obtained from the plant in the following way: When the agave, which yields the liquid honey-water, reaches adult size, turns slightly yellow and begins to shoot up a flower stalk, or before that time, it is tapped by hollowing out a concavity in the core of the plant at the base of the central leaves, which stand upright and are not yet fully expanded. The pulqué gatherer, with a long, hollow gourd, pierced at both ends, draws the aguamiel by suction from the concave place as it wells up from beneath. He is clad in cheap cotton clothes, and wears a hide apron fastened around his waist and a thick leather knee-pad on his left leg. Then pressing the spiny leaves aside with his left knee, he pushes one end of his gourd with his right hand into the tapped place and draws upon the other end with his mouth, until he has filled the gourd with maguey liquid. He then transfers it to a vessel made of pottery reinforced by wicker-work, or, as is the usual custom, he pours it into a vessel made of a hogskin. When his skin vessel is full, he carries it to the shed, where for thirty-six hours,

the agave juice is allowed to ferment, changing during this process from a yellowish-looking fluid to a milk-white, yeasty-looking liquid. It is a very refreshing and wholesome drink for those high altitudes if taken in moderation. Drunkenness is the result of its too free use. It is laxative, and is reputed to be antiscorbutic, and, through its assisting digestion, quiets the heart's action. The best pulqué is obtained in country places, the writer finding its use refreshing and cooling, the city pulqué being inferior to that of the suburban towns, being watery and sour. Pulqué keeps its freshness but a day, when it begins to sour. The sour liquid is distilled, and yields, according to the process used, two or three powerful alcoholic drinks, mezcal, tequila and aguardiente de maguey. There are two or three beverages or soft drinks in use, one made from the pineapple and called piño, and another, tepache, might be termed sugar-cane cider. The latter drink, as a rule, is to be had along most of the country roads running from Mexico. The mezcal, tequila and aguardiente are very powerful in their effects. A Mexican Indian, addicted to their use, can drink a glass of any one of the three without effect; two or three glasses will set him demoniacally crazy.

The alpine flora is interesting on account of the dwarf, cespitose habit of the plants, their hairy covering and brilliantly colored flowers. The plants of this region are mostly perennial, very few annual plants being found in this zone. The lake flora is interesting, as the plants are distributed in the ditches and along the borders of the lagoons and lakes. Eichornia crassipes (the water hyacinth), Marsilia heterophylla, Ruppia, Agenipea, Escobedea linearis, Polygonum amphibium, Nymphæa Mexicana, Lobelia splendens, and a water-lily with white flowers and large leaves—are a few of the plants of the hydrophytic community.

The chinampas, or floating gardens, are in Lakes Chalco and Xochimilcho. At one time they really did float, but now they are anchored to the bottom by the roots of trees, and form little patches of garden ground separated by narrow canals. Here are grown flowers and vegetables for the city market. The canoes of the Indians bring the produce to the city by the Viga Canal, where it is sold along the banks of the canal, or in the markets, the principal one of which is called the Volador, south of the National Palace and occupying a site that was included in the grounds of the "new house" of Montezuma, and, therefore, after the Conquest was a

part of the property of Cortez. Here are sold all manner of fruits and vegetables: apples, peaches, pears, pomegranates, mammees, figs, bananas, tunas, quinces, tomatoes, corn, beans and other agricultural products. The meat and poultry stalls are equally important; but it is to the sellers of herbs that a druggist would turn with most interest.

An old Indian woman, knitting or sewing, occupies a seat in an enclosed stall, surrounded on all sides by dried herbs and medicinal plants. For a small sum of money, she will prescribe for all the ailments to which flesh is heir, drawing upon her supplies of drugs hanging about the stall. These substances are compounded into medicine according to her directions, and it seems that the peons have faith in her skill, for numbers of them were observed around the stall asking medical advice. Casually, while inspecting the market, hasty notes were made of a few of the remedies which composed her stock of drugs. There were panicles of Sambucus Mexicana, dried flowers of Datura arborea, dried plants of Achillea millifolia, a few Mammillarias, tops of Datura with stems and pods, dried gourds, bunches of unknown herbs wrapped in corn-husk, bunches of the pepper tree (Schinus molle), bunches of dried roots, sea beans (Mucuna), hoofs of a deer, ears of a donkey dried, stuffed birds, carapace of a turtle, dried alligator with skin removed, armadillo skins, and other remedies too numerous to mention. I returned again and again to this market, and always found it a source of information and amusement.

Mexico is a very rich and virgin field for ecological study, and is yet an unworked field. Similar observations on other regions have been made by Dr. Eugene Warming, of the University of Copenhagen, several years ago in Venezuela, at Lagoa Santa; by Dr. Scott, who explored the Cape region of South Africa in the Kalahari desert; by Professor Stahl, in Java, and last year in Mexico, and by Dr. Trelease, of the Missouri Botanical Garden, on the Yuccas of the southwestern United States and northern Mexico.

UNIVERSITY OF PENNSYLVANIA.
October, 1896.

Lucium is the name given to a supposed new element found by P. Barrière in monazite sand. It belongs in the cerium, lanthanum and didymium group. Atomic weight, 104.

PROFESSOR GEORGE F. H. MARKOE.

By Wilbur L. Scoville.

Perhaps the future generation will feel more eager to honor the memory of the pioneers in American pharmaceutical education than the present, and, if so, a name which is certain to increase in lustre is that which stands at the head of this article; for to none do the pharmacists, particularly of New England, owe more for present opportunities than to him, who has been well called the Father of the Massachusetts College of Pharmacy.

PROF. G. F. H. MARKOE.

Born in Valparaiso, Chili, S. A., on January 10, 1840, his early childhood was spent in that country, until, at the age of ten, he was sent to dwell with his grandparents in Salem, Mass., where he enjoyed the advantages of the public schools.

Here he made an excellent record for scholarship and proved his abilities for study; but his school opportunities were short, and, after graduating from the grammar school, he began his pharmaceutical career in the store of Mr. James Emerton. Again his studious nature showed itself in a persistent following of the course of study outlined in a syllabus of a course of study by Prof. Wm. Procter, in the *Proceedings* of the American Pharmaceutical Association of 1858. He also took up the study of botany and became well acquainted with the flora of his neighborhood. His enthusiasm for this study afterward brought him into close friendship with the late Professor Asa Gray, of Harvard.

In 1861 he came to Boston and entered the employ of Mr. Charles T. Carney, a pharmacist and chemist of exceptional ability. Here his studies were continued under wise guidance, and he became thoroughly familiar with his Mohr and Redwood's "Pharmacy," and Morfit's "Chemical Manipulations," which were his favorite books. Mr. Carney did considerable chemical manufacturing, and the apprentice had abundant opportunity to put into practice the principles which he learned in his studies.

About 1862 Mr. Markoe entered the store of Mr. Joseph T. Brown, then one of the leading pharmacists of Boston, and he remained here for eleven years, the last three years as a partner.

In 1872 a branch store was established in the Roxbury district, and in 1873 Mr. Markoe severed his connection with Mr. Brown, and became proprietor of the Roxbury store. Now his earlier studies and his broad views of pharmacy were manifested in the business which he established as a manufacturer of chemicals.

He was possessed of considerable of that qualification so necessary to a chemist—mechanical ingenuity—and he was seldom at a loss for apparatus, though his stock of utensils was not large.

He was quick to see the importance of a new method or a new chemical, and he found time to do some experimental work. He was the first in this country to manufacture chloral, which he did on a commercial scale, but found it unprofitable. He also distilled a quantity of oil of bay when that product was attracting its early attention. He had a quantity of fresh leaves sent to him from South America, which he subjected to distillation, and also made a partial analysis of the oil. His results were reported to the American Pharmaceutical Association in a paper which he presented.

At this time he was doing a considerable business in the manufacture of phosphoric acid, which he made by the old process of oxidizing phosphorus with nitric acid. This was a slow method and required close watching, and when, one morning when his stock was low, he received an order for a carboy of the acid, to be delivered within three days, he set seriously to work to devise a quicker process. All day long he studied upon the problem without success, and when he retired at night his mind was still on it. In the early morning he awoke, and the thought suddenly came to him that phosphorus pentabromide, which was easily made, could be oxidized quickly to phosphoric acid by means of nitric acid, with the formation of volatile by-products. He arose immediately and made an experimental test. This worked satisfactorily and he set about the larger quantity. At the specified time the acid ordered was ready for delivery.

The greater part of his time during the years at the Roxbury store was spent in his laboratory, and he gained a considerable reputation as an analytical and consulting chemist.

During all this time he was actively engaged in the affairs of the

Massachusetts College of Pharmacy, which he had joined in 1864. Previous to this time several attempts had been made to establish a course of study for pharmacists, and a series of lectures had been given by well-qualified men upon chemistry and pharmacy, but these had received but little support from the pharmacists. In the spring of 1867 Mr. Markoe and Mr. Lincoln, being duly authorized by the college, succeeded in drawing together a sufficient number of the drug clerks of Boston to warrant the forming of a class, and a course of nine lectures on Practical Pharmacy was given by Mr. Markoe. The interest among the clerks in this course was so marked that the college resolved to establish a permanent school of pharmacy, and the next winter lectures were given upon Practical Pharmacy, Materia Medica and Chemistry, Mr. Markoe being the lecturer on Pharmacy. His connection thus established with the school, as a teacher, was continued to the day of his death. In 1879 he was transferred to the chair of Pharmaceutical Chemistry, succeeding Professor Merrick, and in 1892 he was returned to the chair of Pharmacy, after the resignation of Professor Patch, his former successor.

In the spring of 1896 he was forced to resign this position by failing health, but his resignation was accepted only in part, he being appointed to the less arduous position of Professor of Industrial Pharmacy, in which he would, had he lived, have made his rich experience in chemical work of added value to the students by lectures upon special topics. Unhappily, he never had the opportunity of entering upon the duties of this office.

In 1870 he founded the Alumni Association, and what might almost be termed his last public appearance was at the twenty-fifth anniversary of this association, on May 21, 1895. He was decidedly the most prominent figure at this gathering, and it resolved itself largely into a dinner in his honor.

As a teacher he was enthusiastic and sympathetic. His lectures abounded in information of a practical nature, drawn from his own experiences, and many a student has thanked him repeatedly for "a pointer" in his manipulations.

He took a very broad view of pharmacy, and was identified with many societies belonging to the allied sciences. He joined the American Pharmaceutical Association in 1863, and served as its President in 1875–76. He was also an active member of the Boston

Scientific Society, the Horticultural Society, the Society of Arts, the Society for the Advancement of Science, Massachusetts Pharmaceutical Association, Boston Druggists' Association, etc.

He lectured frequently before some of these, and presented many papers to others. Indeed, his literary work was confined almost entirely to papers which he prepared for the scientific societies of which he was a member. The *Proceedings* of the A. Ph. A. contain many of these.

In 1872 he attended the meetings of the British Pharmaceutical Conference in England, and, upon motion of the late Daniel Hanbury, was elected an honorary member of that body. His visit was most auspicious and he made many valued friends across the water. In 1878 he again visited England, and the cordiality with which he was received was among the pleasantest memories of his life.

His honorary membership in the Royal Pharmaceutical Society of Brussels and several of the pharmaceutical schools and societies of the United States bespeaks the esteem with which he was held here as well as abroad.

In 1891 Dartmouth College conferred upon him the honorary degree of Master of Arts. He has been a member of the Committee of Revision of the U. S. Pharmacopœia for nearly three decades, having been actively engaged in the revisions of 1870, 1880 and 1890. His death makes the second vacancy in that committee within a year.

He served as instructor at the Harvard Medical School from 1872 to 1879.

In 1890 he retired from the retail store in Roxbury and accepted a position with the Burnett Company, of Boston, as managing chemist. Much of his time here was occupied in originating and perfecting new products, and during the few years that he was with them he saw a line of color pastes, smelling salts and toilet perfumes, all of his own devising, successfully launched upon the market.

It was on the floor of his private laboratory at the Burnett Building that he expired suddenly, some time during the late afternoon or the evening of Thursday, September 24th. Apoplexy was the immediate cause of his death, and a sudden end was expected by those who understood his condition.

Professor Markoe was twice married. In 1866 he was united to

Miss Ellen G. Jenners, and one son, George B. Markoe, now in Colorado Springs, Col., was the fruit of this union. Mrs. Markoe died in 1879, after a lingering illness, and in 1881 he was again married, this time to an English lady, Miss Louise E. Moore.

His widow and a daughter, born in 1893, survive him.

Undoubtedly, Professor Markoe possessed the qualifications for a great leader, but was handicapped by the meagreness of his early education. In spite of this, he lived to see a struggling college, which he was the immediate means of starting, grow into a strong and influential institution, and himself publicly honored for his scholarship.

He could not help feeling that in the changes of the past twenty-five years he had no small part, and he derived a genuine, albeit a modest, satisfaction therefrom. His life is a worthy example for the youth of small opportunities, and should be an incentive to redoubled efforts for the strengthening of the ideal in pharmacy.

ANTIMONII OXIDUM AND PULVIS ANTIMONIALIS.

By Charles H. LaWall.

Antimony trioxide, *Antimonii Oxidum*, U. S. P., 1890, was admitted to the Pharmacopœia of the United States in 1860, at which time it was included in the secondary list, comprising the preparations, as a process was given for its manufacture. The edition of 1870, of the same work, retained it in the same class; but in the revision of 1880, at which time the distinction between primary and secondary classes was abandoned, it was included among the compounds of antimony, the process for preparing it being omitted. The present edition made no further change.

The commercial article is used in the arts as a pigment, but has never occupied an important position in medicine, and few retail pharmacies even have it in stock. It enters into the composition of antimonial or James' powder, *Pulvis Antimonialis*, U. S. P., and, in the earlier editions of the Pharmacopœia, it was used in the preparation of tartar emetic. The manufacture of this compound has long since been discontinued by retail pharmacists, the present tendency of pharmacy, regarding chemicals, being more toward analytical than manufacturing work.

Pulvis antimonialis, however, is a preparation requiring very little time or trouble to make, and should be made in every well-conducted establishment. According to the present United States and British Pharmacopœias, it consists of 33 per cent. of antimonous oxide and 67 per cent. of calcium phosphate. The original formula, which was used by a Dr. James, of England, in the early part of the last century, was very crude, and yielded a preparation of varying composition and correspondingly uncertain physiological action. This method was adopted by several of the earlier European Pharmacopœias, and consisted in calcining a mixture of certain proportions of horn shavings and black sulphide of antimony. The uncertainty of the composition of Calcaria phosphorico-stibiata, as it was sometimes called, led to the adoption of various processes ensuring a more uniform product. One of these processes was that of the Dublin Pharmacopœia of 1850. This directed that a solution of tartar emetic should be mixed with a solution of sodium phosphate, after which a solution of calcium chloride and ammonia water were to be added; this caused the precipitation of antimonous oxide and calcium phosphate intimately mixed. The same object is attained by the present process, which consists in thoroughly mixing the precipitated calcium phosphate and antimonous oxide. Several compounds resembling antimonial powder, from the fact that their medicinal efficacy depends upon the presence of antimonous oxide, have been in use in various countries; one of these is Pulvis resolvens, which is composed of 2 parts of potassium sulphate, 1 part of potassium nitrate and 1 part of antimonous oxide; another, called Tyson's antimonial powder, is a much milder form. It contains 2 parts of antimonous oxide and 18 parts of calcium phosphate.

Several oxides of antimony are known. The trioxide or antimonous oxide, Sb_2O_3, exists in nature principally as valentinite and senarmontite. It is prepared artificially by several methods, which are given in the leading chemical text-books. Its presence is established in a mixture of the different oxides by the black precipitate of argentous oxide which is produced when solution of silver nitrate is added to a solution of the oxide in potassium hydrate; the addition of ammonia water dissolves the precipitate caused by the higher oxides or the antimonates, but does not dissolve the argentous oxide.

The pentoxide or antimonic oxide, Sb_2O_5, does not exist in nature, but is prepared artificially. It is easily distinguished from the trioxide by the liberation of iodine, which takes place when potassium iodide is added to a solution of the oxide in hydrochloric acid.

The so-called tetroxide, Sb_2O_4, considered by some authors as antimonous antimonate $Sb_2(SbO_4)_2$, or antimonyl antimonate, $(SbO)SbO_3$, is obtained when either of the other oxides is ignited with access of air. It acts in some respects as a compound containing both Sb_2O_3 and Sb_2O_5; but while it liberates iodine from potassium iodide like the pentoxide, it does not resemble the trioxide by precipitating argentous oxide. Several hydrated compounds of these oxides are known, their formation depending upon the method of precipitation and the temperature at which the precipitate is dried.

Three different methods were used for the estimation of the antimony in the samples of oxide examined by the writer. No. 1 was based upon the following equation: $4I + Sb_2O_3 + 2H_2O = 4HI + Sb_2O_5$. This method served for the estimation of the antimonous oxide. The details of the process are as follows: a weighed quantity of the oxide (about 0·2 gm.) is warmed with an excess of tartaric acid solution for about fifteen minutes; the excess of acid is then neutralized with sodium carbonate, and a saturated solution of sodium bicarbonate in water is added, in the proportion of about 20 cubic centimetres to each 0·1 gm. of Sb_2O_3 taken. The liquid is then titrated with decinormal iodine solution, using starch paste as an indicator. The percentage of antimony is easily calculated from the amount of iodine solution used, each cubic centimetre of the latter corresponding to ·006 gramme Sb.

Method No. 2 depended upon the reducing action of hydriodic acid upon antimonic compounds, $SbCl_5 + 5KI = SbI_3 + 2I + 5KCl$, hydrochloric acid being present in the solution. It was used for estimating the total amount of Sb present by first heating the sample in a beaker with HCl and $KClO_3$, whereby antimonous compounds are oxidized to antimonic. The chlorine is then driven off by heating in a water-bath, the liquid is cooled and potassium iodide is added in excess. The iodine liberated is estimated by titration with decinormal sodium thiosulphate solution, the results being calculated in the same manner as those in the previous case.

The third method consisted in igniting Sb_2O_5 to form Sb_2O_4, which is then weighed and the per cent. of Sb calculated. To a weighed portion of the oxide in a porcelain crucible fuming nitric acid is added and carefully driven off by applying gentle heat; this oxidizes the slightly volatile antimonous oxide. The crucible is then heated to redness until a constant weight is reached. 100 parts of Sb_2O_4 represent 78·94 parts of Sb, or 94·73 parts of Sb_2O_3.

Six samples were examined, using all three of the methods of estimation upon each specimen. The first and third samples were made from a solution of antimony terchloride, which had been prepared by the action of nitro-hydrochloric acid upon metallic antimony. This solution, which was not made by the writer, contained antimonic chloride, indicated by appropriate tests; it had a specific gravity of 1·515; the percentage of antimony, determined by method No. 1, was 5·92, corresponding to 11·13 per cent. $SbCl_3$; the percentage by method No. 2 was 6·28, corresponding to 15·00 per cent. $SbCl_5$. The samples of oxide obtained by the decomposition of this solution consisted of a mixture of the two oxides, the variation in proportion being, doubtless, in the hydration of the higher oxide.

The second sample was obtained in the market; but, after finding that it consisted entirely of the higher oxide, inquiry was made, which developed the fact that it was stibic acid and not the official oxide.

Sample No. 4 was made by the writer, using the process of the 1870 Pharmacopœia. It shows the reliability of that process for manufacturing a U.S.P. product.

Sample No. 5 was obtained in the market, in an original package bearing the label of a well-known chemical manufacturing firm. This sample was also of good quality.

Sample No. 6 was a commercial article from another large manufacturing house, and was of fair quality except in appearance, which was very unfavorable.

Samples Nos. 4 and 5, being the only specimens which answered the requirements for appearance and solubility, were further examined for chlorides, sulphates and metallic impurities. They complied with the U.S.P. requirements in every particular.

The results of the examinations are appended in tabular form for the purpose of ready comparison.

No. of Sample.	Estimated Sb by Method No. 1.	Sb by Method No. 2.	Sb by Method No. 3.	Remarks.
1	26·70	69·12	70·23	
2	—	58·43	68·29	Labeled stibic acid.
3	48·00	70·92	71·27	
4	82·68	82·40	82·91	U.S.P. in every respect.
5	81·84	80·40	82·55	U.S.P. in every respect.
6	71·05	78·34	81·61	For use in the arts.

The per cent. of Sb_2O_3 in the different samples, calculated from the amount of Sb estimated by process No. 1, is as follows:

Sample No. 1, 32·04 per cent.; sample No. 2, not estimated; sample No. 3, 57·60 per cent.; sample No. 4, 99·21 per cent.; sample No. 5, 98·21 per cent.; sample No. 6, 85·26 per cent.

An attempt was made to estimate the Sb in the Sb_2O_4 obtained by the ignition method, using the other two processes, but no satisfactory results could be obtained.

305 Cherry Street, Philadelphia, Pa.

THE TANNIN OF SOME ACORNS.

By Henry Trimble.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy. No. 159.

Having been repeatedly questioned concerning the astringent value of acorns, I determined this year to make some tests of them from a few species of oaks. The season just passed has been one in which the oaks of this vicinity fruited abundantly. In a good season the chestnut oak, Quercus prinus, probably yields the greatest amount of fruit, as the acorns are very large; the white oak, Q. alba, however, bears very abundantly, as shown in the accompanying illustration, *Fig. 1.* A tree covered with fruit is a conspicuous object about the first of September, and until the acorns fall a month later.

Fig. 1.—Branch of White Oak in fruit.

In order to refresh the memory of the reader, a sectional illustration of a chestnut oak acorn is shown in *Fig. 2.*

The several parts of the chestnut oak acorns were assayed for tannin, commencing September first, when they had reached their full size, and continued at intervals until the first of October, when they had fallen. The acorns of this species were taken for investigation because of their large size and abundance, also because they are the fruit of the species of oak whose bark is the most highly prized for its tanning value.

The estimations of tannin were made as soon after the collection of the fruit as possible. It was necessary, therefore, to determine the moisture, and make a calculation of the amount of tannin in the

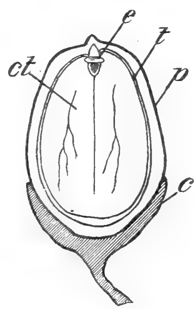


Fig. 2.—Section of Acorn. *c*, cupule; *p*, pericarp; *t*, testa; *e*, embryo; *ct*, cotyledon.

absolutely dry substance, so that in the following results the tannin and ash are both based on the absolutely dry substance:

ACORNS OF QUERCUS PRINUS, L.

Part Estimated.	Date of Collection.	Moisture.	Ash in Dry Substance.	Tannin in Dry Substance.
Cupule	August 29	50·56	1·73	18·20
Cupule	September 20	14·24	1·49	19·00
Cupule	October 4	11·76	1·32	13·37
Pericarp	August 29	13·57	1·66	15·96
Testa	August 29	11·65	1·94	42·10
Testa	September 20	11·01	2·62	48·09
Cotyledons	August 29	34·90	1·07	8·75

It will be seen from these figures that the testa is exceedingly rich in tannin, but the small amount of this coating in each acorn and the difficulty of separating it preclude the possibility of it becoming a profitable source of that compound.

The cupule usually attracts attention on account of its astringency, and it will be observed that when it is collected during September it is valuable; but the difficulty of collection from the trees would be an industrial drawback, and after it falls the deterioration is considerable, as shown in that collected on October 4th, which collection was from those which had fallen to the ground.

A quantity of the tannin was extracted from the cupules of the chestnut oak, and purified. It resembled, in physical and chemical characters, that of all the oak barks heretofore examined by me, by giving a green color and precipitate with salts of iron, a precipitate with bromine water, and a pink color with calcium hydrate. On combustion it yielded the following percentages, which are compared with the average composition of the tannins obtained by me from nine species of oak bark:

	Tannin from Cupules of Chestnut Oak.	Average Obtained on the Tannins from Nine Species of Oak Bark.
Carbon	59·93	59·79
Hydrogen	5·76	5·08
Oxygen	34·31	35·13
	100·00	100·00

The following are the percentages of tannin found in the cupules of a number of other oak species:

	Date of Collection.	Moisture.	Ash in Dry Substance.	Tannin in Dry Substance.
Quercus alba, L.	Aug. 29	40·85	2·24	11·75
Quercus macrocarpa, Michx.,	Aug. 31	56·14	5·59	10·37
Quercus rubra, L.	Aug. 30	28·86	2·77	5·27
	Oct. 4	7·66	2·76	4·55
Quercus velutina, Lam.	Aug. 30	13·85	3·16	7·77
Quercus coccinea, Wang.	Aug. 29	21·03	1·99	12·66
Quercus digitata, Marsh.	Oct. 18	46·52	4·34	5·98

I am indebted to J. C. Peacock for the preparation, purification and ultimate analyses of the tannin from the cupules of the chestnut oak; and to G. H. Maghee for the estimation of the tannin in the cotyledons of chestnut oak, and for repeating my estimations in a number of other cases, thereby confirming them. The hide-powder process was used in all the estimations.

A HISTORY OF THE PHARMACEUTICAL MEETINGS OF THE PHILADELPHIA COLLEGE OF PHARMACY.

By Thomas S. Wiegand.

As this is the first of the pharmaceutical meetings for the series of 1896–97, it was thought that a historical sketch of their inception and some of the subjects that had been brought before the College at these meetings would be interesting, especially to the younger members of the College and such of our classes as might be present.

In the College minute book for 1841, under date of December 27th, it is noted that the following-named persons: Wm. R. Fisher, Charles Ellis, Wm. Procter, Jr., Samuel F. Troth, Jos. C. Turnpenny, Ambrose Smith and John H. Ecky, addressed a communication to the College, asking that they, and such others as would associate themselves with them, be granted the use of the hall and library to conduct discussions, institute scientific investigation and report upon matters of interest to pharmacists, basing their request upon the advantage and interest which had accrued from meetings of similar character, held in the Paris Society of Pharmacy, and in the lately established Pharmaceutic Society of Great Britain.

It was determined not to introduce the ordinary business affairs of the College or trade into these meetings.

In response to this proposition, the College gave its sanction to the application, and directed that these meetings be known as the "*Pharmaceutic Meetings* of the Philadelphia College of Pharmacy."

As we rehearse the names of those who made the application, how much of local professional pride is stirred when we remember how well these men, each and every one of them, bore their part in the ordinary work of the College, as well as in bringing forward matters of scientific interest to help the then struggling pharmacists to do better and more accurate work in their chosen calling.

The first action, arranging methods for conducting these meetings, was taken June 26, 1842. The time, the reading of the minutes, correcting them, if necessary, and adopting them, introduction of strangers, donations to library and cabinet, reports of committees, written and verbal communications, miscellaneous business and conversation, was the plan mapped out, and it will be seen how well the originators of the meetings comprehended the needs of the

occasion, for they have proven useful to the present time, almost exactly as when first adopted.

The essays then presented were referred to a committee for examination, who were expected to report at the following meeting, unless otherwise ordered; the strangers who were introduced were entitled to participate in the scientific discussions.

At a meeting of the College, held September 27, 1842, an amendment to the by-laws directed that the pharmaceutical meetings should be limited exclusively to scientific subjects, and the committee, on motion of Samuel F. Troth, were directed to notify the members of the College, by circular, of the meetings, and invite their attendance and co-operation.

From 1844 to 1850 the meetings seem to have been held, but few notices of their proceedings have been found, either in the minute book of the College or the JOURNAL OF PHARMACY.

In the year 1856 the members were notified that the meetings were held on the first Monday of every month, from October to May, inclusive. We find notices that the Library received quite a large number of books, and that valuable additions to the Cabinet had also been received: four papers upon chemical subjects, two upon materia medica and five upon pharmaceutical matters—thus showing that matters of practical and every-day interest had their full share of attention. Notwithstanding all this, the meetings fell off in interest, and were for some time discontinued.

In 1870 the meetings were resumed, after an interruption of some ten years. Dr. Pile, Israel J. Grahame and Prof. Maisch were requested to bring forward an order of business for them, which was done, and a standing committee of three were appointed to bring forward subjects of interest to the attention of the meetings.

At the first one, Prof. Maisch called attention to the difference between a species of gum known as gum sennaar and that derived from the Acacia vera. The committee reported that members of the College, and all others who may desire to participate in the proceedings, be earnestly invited to attend and bring forward either written or oral contributions upon subjects germane to the sciences we are interested in; that the presiding officer of the meeting call for discussions upon the subjects under consideration; that a standing committee bring forward such subjects as may be of interest, in addition to what may be brought up by the members.

The members were invited to propose queries upon subjects in which they felt interested, which queries might be answered at once or referred to a future meeting.

Dr. Bridges, at this meeting (November, 1870), described the process of etching on glass by means of the sand blast, and thought it would likely supersede much of the engraving upon glass. He also explained the discovery and the principle of the spectroscope and the wonderful revelations thus far made by it, and the prospect that is opened up for discoveries even more wonderful than those yet made known. An exhibition of the instrument was then given by Prof. Bridges, assisted by Mr. Bullock.

At the December meeting, Dr. Pile explained and illustrated rules for changing the strength of strong alcohol to proof spirit, to reduce alcohol to any required strength, or to make any required quantity of any of the above-mentioned liquids.

Dr. Pile also called attention to a prescription, the use of which had resulted fatally. The prescription is as follows:

℞ Strychniæ Murias, gr. iss.
Syrupi Ferri Iodidi, f℥vi.
Syrupi Zingiberis, q. s. ft. f℥iii.
Misce. Sig.—Teaspoonful three times a day.

The Doctor stated that he had compounded the prescription, carefully dissolving the muriate of strychnia, and had kept it several months, without sign of precipitation. He thought that if the alkaloid was added without being dissolved, the last dose would contain nearly all the strychnia, and hence the fatal results.

An examination of the subjects reported to the different meetings shows that over 500 different papers have been reported on, and many of these were of the greatest advantage to a large number of those who were listeners at these meetings. This should be a strong incentive to every attendant to bring up for discussion any subject that may interest or even perplex him in the daily round of shop work.

Iodide of Starch in Surgery.—Majewski (*Wiener med. Presse*, 1896, No. 19; *Centralblatt für Chirurgie*, August 1, 1896) recommends iodide of starch as an excellent application in suppurating and neglected wounds, phlegmons, panaritia and venereal sores. A mixture of 1 part of tincture of iodine and 2 parts of starch, he says, exceeds iodoform in antiseptic action and in controlling suppuration. It is exceedingly hygroscopic, almost odorless and very agreeable.—*New York Medical Journal.*

ABSTRACTS FROM THESES.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy. No. 160.

ESTIMATION OF AMMONIUM CHLORIDE IN TABLETS.

Albert B. Johnson, Ph.G., made experiments with the view of devising a process for the estimation of ammonium chloride in the compressed tablets of this substance, and such organic matters as licorice, etc. The following processes were found to give practically concordant results. For the ammonia: powder a few of the tablets, weigh a portion of the powder: place it in a flask, add water; make the mixture alkaline with sodium or potassium hydrate solution; connect the flask with a condenser provided with a receiving flask containing a measured volume of decinormal oxalic acid volumetric solution to absorb the ammonia, and distil until two-thirds of the volume in the first flask has passed over. Then titrate the excess of acid in the receiving flask with decinormal potassium hydrate volumetric solution, using rosalic acid as indicator. Calculate the amount of ammonia found into ammonium chloride, and this by proportion to the weight of powdered tablets taken into percentage. For the chlorine: take another weighed portion of the powdered tablets, mix it well in a mortar or other vessel, with four or five times its bulk of chlorine-free calcium carbonate, introduce the mixture into a tube of hard glass, closed at one end, and previously charged with a layer of unmixed calcium carbonate; rinse the mixing vessel with several small portions of carbonate, transferring each in succession to the tube, and follow these with a layer of plain carbonate. Heat the tube to low redness by means of a Bunsen burner (or combustion furnace), beginning at the end of the chargé next the open end, and gradually extending the heat toward the closed end until all the carbonaceous matter is consumed, which is indicated by the disappearance of charred matter. Allow the tube to cool somewhat, then break it by carefully blowing on it a a few drops of water from wash bottle; add water to the broken mass, then nitric acid until effervescence ceases, warm gently, filter to remove fragments of glass, and completely precipitate the filtrate with silver nitrate, boiling to coagulate the precipitate. Collect the precipitate on balanced filters, wash and dry at 130° C. to a constant weight. Calculate the silver chloride into ammonium chlor-

ide, then the percentage of this ingredient by proportion to the weight of powdered tablets taken.

The small amount of ammonia in the licorice was disregarded. If the ammonia and chlorine exist in the tablets only as ammonium chloride, it is obvious that the results of the foregoing operations should be identical. Of course, if it is desired to ascertain the number of grains of ammonium chloride in each tablet, the number of tablets taken should be noted, the tablets then weighed, afterwards powdered and an aliquot part of the powder taken for each analysis, so that the answer may be obtained by dividing the number of grains equal to the grammes of ammonium chloride found by the number of tablets represented by the aliquot part used.

ASSAY OF FLUID EXTRACT OF COCA.

Kingsley C. T. Schneider, Ph.G., assayed eight fluid extracts of coca. After some preliminary experiments it was found that Lloyd's process gave the best results of the several methods tried. The green coloring matter was separated by dissolving the crude alkaloid in acidulated water and filtering; the alkaloid was thereafter extracted by making alkaline with ammonia water and shaking with chloroform, which, upon evaporation, left the alkaloid. To preserve the accuracy of the process 10 c.c. of the fluid extract were used for each assay. The following results were obtained: 0·535, 0·485, 0·675, 0·655, 0·625, 0·370, 0·335 and 0·675 per cent. These figures indicate the difference in the strengths of this preparation as found in the market of the United States.

ASSAY OF TINCTURE OF NUX VOMICA.

Olive C. Johnson, Ph.G., assayed sixteen samples of this preparation by the official method. Five of these were from manufacturing houses and eleven from retail druggists in Philadelphia. The former of these showed, respectively, 0·33, 0·31, 0·31, 0·27 and 0·24 per cent. of total alkaloids. Of the eleven samples from retail stores, one was made by the 1870 United States Pharmacopœia formula; it contained a large amount of oil and only 0·16 per cent. of alkaloids; three were made by the 1880 United States Pharmacopœia method; they contained oil and resin; their strengths ranged from 0·20 to 0·30 per cent. of alkaloids. One was made from a concentrated preparation of a manufacturer; it was practically free from

resin and oil, and contained 0·28 per cent. of alkaloids. The remaining six samples were prepared according to the directions of the 1890 Pharmacopœia, they were almost free from oil and resin. The greatest amount of alkaloids present was 0·31 per cent., while the least amount found was 0·25 per cent.

EXAMINATION OF TINCTURE OF IODINE.

Leon K. Baldauf, Ph.G., on account of the change made in the strength of this tincture in the last revision of the Pharmacopœia, assayed twenty samples in order to ascertain the quality of the article as dispensed. The official method of estimation was employed. In most cases a wide departure from the official strength of 7 per cent. was found; one sample contained but one-half the required amount. Two of the samples were stronger than necessary. The average strength was 5·79 per cent.

A RÉSUMÉ OF RECURRENT TOPICS.

BY WILLIAM B. THOMPSON.

Sponge.—The consumption of sponges appears to be largely in favor of the American market, from three to four times the weight shipped to Great Britain, France and Holland united, being assigned to the United States. This may be due to some extent to the fact that the principal fisheries lie nearest to our coasts. The modification by warmth of the Gulf Stream, likewise the eastern Mediterranean, may have an important operating influence on sponge growth. This is a fact worth ascertaining. This may be said of the Americans, which cannot be said of all other nations, that the virtue and luxury of cleanliness is highly esteemed among us as a people, and as a means to sanitation and as an adjunct to the bath, the sponge is both grateful and useful. Our increasing consumption is, therefore, due to our appreciation, not our needs. It goes as an accompaniment to refinement and a higher civilization. It is an interesting fact in the history of sponge that a certain curative effect, when externally applied, led to an investigation and the discovery of that important elementary substance, iodine, as one of its constituents. Therapeutically, the carbonaceous residue of charred sponge offers not only an antiseptic property, but it should afford, through its contained salts, an effective resolvent for glandular

enlargement and other manifestations of strumous diathesis. Commercially considered, sponge is one of the apothecary's chief staples, an exhaustless object of display by pyramid and festoon. In those frequent domestic calamities of *spilled milk* and *ink*, sponge is the first aid and hope to the distracted. The preparation of curing and bleaching of sponges by art appears to be chiefly a foreign industry, and the finer sorts come to us from these sources. When the propagation and growth of sponge become better understood, and they become an applied industry, as they assuredly will, opportunities of studying the habitat of the various varieties and textures of this marine vegetable growth will be sought, and the means to further the object applied.

Rattlesnake Root from Senock.—This was the title and derivation of our seneca snake root, as given by an English drug merchant to an American correspondent as early as 1740. The value of the native or indigenous materia medica of America began very early in the history of the colonies to attract the attention of English drug merchants, and they became very eager to add to their stores those herbs, barks and parts of plants which traced their properties and uses solely to the domestic practice of the aborigines of America. England then, as now, produced no fruits, or even natural productions except cereals; all that grew was the result of artificial cultivation. Many foreign drugs were sent in exchange for our products, rhubark, seneca, and the spices figuring largely in our imports. Our people had brought some knowledge of the uses of these from the various "faderlands," but those of our soil possessed much of interest to foreigners. England began early in the history of commerce to take a conspicuous position. The products of every clime were carried to her stores largely in her own ships, and her chief city soon became an emporium for the whole earth, and the mart of the world. Among the beneficent designs which are seen in the works of Providence, Nature has purposely distributed her blessings among the different regions of the world, that inter-traffic should be promoted, and that the influences of civilization should flow from the intercourse of nations, the supplies of one region inviting the productions of another. Britain extended her domain and empire through the avenues of trade, and her merchants impressed a character upon the moral integrity of business, which holds to this day. In the drug trade, at the period referred to, the Quaker element

seemed to predominate. They are illustrious names in English pharmacy. They loved and pursued honesty and truth as dominant virtues of character. They were intelligent, God-fearing, and their written language is expressed in plain, mild, but forceful Anglo-Saxon. To their honor be it also said that they were staunch and loyal to the highest degree in maintaining the purity of medicines.

Chemists Exposed to Risk and Injury.—That is certainly a noble frame of mind which, by the force of will and purpose, takes from misfortune deplorable consequence, and often happily changes the current of occupation into channels where the individual can be equally, if not more, useful to society, and at the same time promote his own happiness. A noted chemist, losing an eye by an unfortunate laboratory mishap—an explosion—betook himself, as a means to restore health and divert the thought of his calamity, to the country for a partial residence. There he became, in order to acquire rudimentary knowledge, an agricultural laborer! Intelligence rapidly advanced him; by no tedious steps he adopted horticulture and fructiculture, until he had made a fame and a pecuniary success.

SIR JOSEPH LISTER ON ANTITOXINS.

The following, taken from the presidential address of Sir Joseph Lister before the British Association for the Advancement of Science, at the recent meeting in Liverpool, may be accepted as indicating the present status of diphtheria antitoxin, coming as it does from such an authentic source:

It was shown several years ago by Roux and Yersin, working in the Institut Pasteur, that the crust or false membrane, which forms upon the throats of patients affected with diphtheria, contains bacteria which can be cultivated outside the body in a nutrient liquid, with the result that it acquires poisonous qualities of astonishing intensity, comparable to that of the secretion of the poison-glands of the most venomous serpents; and they also ascertained that the liquid retained this property after the microbes had been removed from it by filtration, which proved that the poison must be a chemical substance in solution, as distinguished from the living element which had produced it. These poisonous products of bacteria, or toxins, as they have been termed, explain the deadly effects of some microbes which it would otherwise be impossible to understand. Thus

in diphtheria itself the special bacillus, which was shown by Löffler to be its cause, does not become propagated in the blood, like the microbe of chicken cholera, but remains confined to the surface on which it first appeared; but the toxin which it secretes is absorbed from that surface into the blood, and so poisons the system. Similar observations have been made with regard to the microbes of some other diseases, as, for example, the bacillus of tetanus, or lockjaw. This remains localized in the wound, but forms a special toxin of extreme potency, which becomes absorbed and diffused through the body.

Wonderful as it seems, each poisonous microbe appears to form its own peculiar toxin. Koch's tuberculin was of this nature, a product of the growth of the tubercle bacillus in culture media. Here again, great effects were produced by extremely minute quantities of the substance; but here a new peculiarity showed itself, viz.: that patients affected with tubercular disease, in any of its varied forms, exhibited inflammation in the affected part, and general fever after receiving under the skin an amount of the material which had no effect whatever upon healthy persons. I witnessed in Berlin some instances of these effects, which were simply astounding. Patients affected with a peculiar form of obstinate ulcer of the face showed, after a single injection of the tuberculin, violent inflammatory redness and swelling of the sore and surrounding skin; and, what was equally surprising, when this disturbance subsided the disease was found to have undergone great improvement. By repetition of such procedures, ulcers, which had been steadily advancing in spite of ordinary treatment, became greatly reduced in size and, in some instances, apparently cured. Such results led Koch to believe that he had obtained an effectual means of dealing with tubercular disease in all its forms. Unhappily the apparent cure proved to be only of transient duration, and the high hopes which had been inspired by Koch's great reputation were dashed. It is but fair to say that he was strongly urged to publish before he was himself disposed to do so, and we cannot but regret that he yielded to the pressure put upon him.

But, though Koch's sanguine anticipations were not realized, it would be a great mistake to suppose that his labors with tuberculin have been fruitless. Cattle are liable to tubercle and, when affected with it, may become a very serious source of infection for human beings,

more especially when the disease affects the udders of cows and so contaminates the milk. By virtue of the close affinity that prevails between the lower animals and ourselves, in disease as well as in health, tuberculin produces fever in tubercular cows, in doses which do not affect healthy beasts. Thus, by the subcutaneous use of a little of the fluid, tubercle latent in internal organs of an apparently healthy cow can be with certainty revealed, and the slaughter of the animal after this discovery protects man from infection.

It has been ascertained that glanders presents a precise analogy with tubercle as regards the effects of its toxic products. If the microbe which has been found to be the cause of this disease is cultivated in appropriate media, it produces a poison which has received the name of mallein; and the subcutaneous injection of a suitable dose of this fluid into a glandered horse causes striking febrile symptoms, which do not occur in a healthy animal. Glanders, like tubercle, may exist in insidious, latent forms, which there was formerly no means of detecting, but which are at once disclosed by this means. If a glandered horse has been accidentally introduced into a large stable, this method of diagnosis surely tells whether it has infected others. All receive a little mallein. Those which become affected with fever are slaughtered, and thus, not only is the disease prevented from spreading to other horses, but the grooms are protected from a mortal disorder.

This valuable resource sprang from Koch's work on tuberculin, which has also indirectly done good in other ways. His distinguished pupil, Behring, has expressly attributed to those researches the inspiration of the work which led him and his since famous collaborateur, the Japanese, Kitasato, to their surprising discovery of antitoxic serum. They found that if an animal of a species liable to diphtheria or tetanus received a quantity of the respective toxin, so small as to be harmless, and afterwards, at suitable intervals, successively stronger and stronger doses, the creature, in course of time, acquired such a tolerance for the poison as to be able to receive with impunity a quantity very much greater than would at the outset have proved fatal. So far, we have nothing more than seems to correspond with the effects of the increasingly potent cords in Pasteur's treatment of rabies. But what was entirely new in their results was that, if blood was drawn from an animal which had acquired this high degree of artificial immunity, and some of the clear

fluid, or serum, which exuded from it after it had clotted, was introduced under the skin of another animal, this second animal acquired a strong, though more transient, immunity against the particular toxin concerned. The serum in some way counteracted the toxin, or was antitoxic. But more than that, if some of the antitoxic serum was applied to an animal after it had already received a poisonous dose of the toxin, it preserved the life of the creature, provided that too long a time had not elapsed after the poison was introduced. In other words, the antitoxin proved to be not only preventative, but curative.

Similar results were afterwards obtained by Ehrlich, of Berlin, with some poisons not of bacterial origin, but derived from the vegetable kingdom; and quite recently the independent labors of Calmette, of Lille, and Fraser, of Edinburgh, have shown that antidotes of wonderful efficacy against the venom of serpents may be procured on the same principle. Calmette has obtained antitoxin so powerful that a quantity of it, only $\frac{1}{200000}$ part of the weight of an animal, will protect it perfectly against a dose of the secretion of the poison glands of the most venomous serpents known to exist, which, without such protection, would have proved fatal in four hours. For curative purposes larger quantities of the remedy are required, but cases have been already published by Calmette in which death appears to have been averted in the human subject by this treatment.

Behring's darling object was to discover means of curing tetanus and diphtheria in man. In tetanus the conditions are not favorable, because the specific bacilli lurk in the depths of the wound, and only declare their presence by symptoms caused by their toxin having been already in a greater or less amount diffused through the system; and in every case of this disease there must be a fear that the antidote may be applied too late to be useful. But in diphtheria the bacilli very early manifest their presence by the false membrane which they cause upon the throat, so that the antitoxin has a fair chance; and here we are justified in saying that Behring's object has been attained.

The problem, however, was by no means so simple as in the case of some mere chemical poison. However effectual the antitoxin might be against the toxin, if it left the bacilli intact, not only would repeated injections be required to maintain the transient

immunity to the poison perpetually secreted by the microbes, but the bacilli might, by their growth and extension, cause obstruction of the respiratory passages.

Roux, however, whose name must always be mentioned with honor in relation to this subject, effectually disposed of this difficulty. He showed by experiments on animals that a diphtheritic false membrane, rapidly extending and accompanied by surrounding inflammation, was brought to a stand by the use of the antitoxin, and soon dropped off, leaving a healthy surface. Whatever be the explanation, the fact was thus established that the antitoxic serum, while it renders the toxin harmless, causes the microbe to languish and disappear.

No theoretical objection could now be urged against the treatment, and it has, during the last two years, been extensively tested in practice in various parts of the world, and it has gradually made its way more and more into the confidence of the profession. One important piece of evidence in its favor in this country is derived from the report of the six large hospitals under the management of the London Asylums Board. The medical officers of these hospitals at first naturally regarded the practice with skepticism; but as it appeared to be at least harmless, they gave it a trial, and during the year 1895 it was very generally employed upon the 2,182 cases admitted, and they have all become convinced of its great value. In the nature of things, if the theory of the treatment is correct, the best results must be obtained when the patients are admitted at an early stage of the attack, before there has been time for much poisoning of the system, and, accordingly, we learn from the report that, comparing 1895 with 1894, during which latter year the ordinary treatment had been used, the percentage of mortality—in all the six hospitals combined—among the patients admitted on the first day of the disease, which in 1894 was 22·5, was only 4·6 in 1895; while for those admitted on the second day the numbers are 27 for 1894 and 14·8 for 1895. Thus, for cases admitted on the first day, the mortality was only one-fifth of what it was in the previous year, and for those entering on the second it was halved. Unfortunately, in the low parts of London, which furnish most of these patients, the parents too often delay sending in the children till much later; so that on the average no less than 67·5 per cent. were admitted on the fourth day of the dis-

ease, or later. Hence, the aggregate statistics of all cases are not nearly so striking. Nevertheless, taking it altogether, the mortality in 1895 was less than had ever before been experienced in those hospitals. I should add that there was no reason to think that the disease was of a milder type than usual in 1895, and no change whatever was made in the treatment, except as regards the antitoxic injections.

There is one piece of evidence recorded in the report which, though it is not concerned with high numbers, is well worthy of notice. It relates to a special institution to which convalescents from scarlet fever are sent from all the six hospitals. Such patients occasionally contract diphtheria, and when they do so, the added disease has generally proved extremely fatal. In the five years preceding the introduction of the treatment with antitoxin, the mortality from this cause had never been less than 50 per cent., and averaged, on the whole, 61·9 per cent. During 1895, under antitoxin, the deaths among the 119 patients of this class were only 7·5 per cent., or one-eighth of what had been previously experienced. This very striking result seems to be naturally explained by the fact that these patients being already in hospital when the diphtheria appeared, an unusually early opportunity was afforded for dealing with it.

There are certain cases of so malignant a character from the first that no treatment will probably ever be able to cope with them. But taking all cases together, it seems probable that Behring's hope that the mortality may be reduced to 5 per cent. will be fully realized when the public become alive to the paramount importance of having the treatment commenced at the outset of the disease.

THE PROPERTIES AND USES OF FORMALDEHYDE.[1]

BY F. C. J. BIRD.

The antiseptic and disinfectant properties of formaldehyde have been extensively investigated during the last two years, and the results obtained, both by bacteriologists and in the practice of various industries, have given it at once an important position amongst bactericidal agents. Formaldehyde is gaseous at ordinary temperatures, but is now obtainable, commercially, as a concentrated solu-

---

[1] *Pharmaceutical Journal*, September 26, 1896.

tion containing 40 per cent. of the aldehyde. Most of the published experiments have been made with this solution, which is placed on the market under various trade names.

Hoffman discovered formaldehyde in 1867. Loew subsequently demonstrated its germicidal powers, and Berlioz and Trillat suggested its use as a powerful disinfectant free from poisonous properties. It has the formula HCHO, is a powerful reducing agent, and when oxidized yields formic acid. A solid polymeric variety—paraformaldehyde—is also known. There are several chemical processes by which the aldehyde may be prepared, but the most practicable is that dependent on the limited oxidation of methylic alcohol. If a current of air charged with methylic alcohol vapor be passed over a coil of glowing platinum or platinized asbestos, and the escaping gases condensed in a Liebig's condenser, a weak solution of formic aldehyde in methyl alcohol results. The substitution for the platinum spiral of a roll of superficially oxidized copper gauze gently heated in a glass tube through which the mixed vapors are passed, the product being led into water, greatly increases the yield, it being possible by this means to obtain a solution containing 15 to 20 per cent. of formic aldehyde. The commercial solution, "formalin," is understood to be manufactured by a similar process to the foregoing, probably with improved details, by which a higher percentage strength in the product is ensured.

The 40 per cent. solution of formaldehyde, as met with in commerce, is a liquid of a pale sea-green tint, specific gravity about 1·070, acid reaction, and possessing a pungent and very characteristic odor. In more concentrated solutions the formaldehyde tends to pass into the polymeric and comparatively inactive form; this, therefore, is the strongest solution which will remain permanent. The acidity is due to formic and acetic acids, and the faint sea-green tint to a salt of copper, a distinct film of that metal being deposited on a bright steel knife-blade when immersed in the liquid for a short time. When exposed to the air, formaldehyde vapors gradually diffuse, and the solution loses strength.

With regard to the toxicity or otherwise of formaldehyde in solution, when taken internally, no record of exact experiments relating to its physiological action on the human subject appears to exist, and information such as we possess concerning salicylic acid, carbolic acid, mercuric chloride, etc., is wanting. The solid polymer

may be given in doses up to 90 grains as an intestinal antiseptic, its action depending on small quantities of formaldehyde that are continuously liberated; and this is put forward as one proof of the harmless nature of the antiseptic. Dr. Rideal is said to have taken a considerable quantity of a 1 per cent. solution without experiencing any ill effects.

Formaldehyde ranks high as a deodorant. Either as vapor or in solution it almost instantly removes the putrid odor of decomposing animal or vegetable matter, combining with sulphuretted hydrogen, mercaptan, ammonia and ammonia bases generally to form inodorous compounds. With ammonia it gives hexamethyleneamine. Putrid meat, broth, urine, fæces, etc., are immediately deodorized when treated with a little of the 40 per cent. solution.

The vapors given off by the solution are extremely irritating to the eyes and the mucous membrane of the nose and throat, so that care should be taken when handling the solution not to spill any on the hands or skin, as it is found to have a similar effect to strong carbolic acid. No pain is felt at the moment, but afterwards the skin becomes quite insensitive, and very rough and white wherever the liquid has been in contact with it.

Gelatin exposed to formaldehyde vapor becomes insoluble even in hot water, and animal tissues generally are hardened in a remarkable manner. This property is turned to account in the rapid hardening of tissues for microscopical examination, and in photography; Dr. C. L. Schleich has also prepared from the formalized gelatin an antiseptic dusting powder for wounds. Dr. Schleich dissolves gelatin in water, adds 25 minims of "formalin" to the pound of gelatin, and dries and powders the product. This powder, in contact with healthy or inflamed tissue, disengages formaldehyde vapor, thus maintaining an antiseptic atmosphere around the wound. Necrotic tissue or masses of dried secretion may prevent contact between the powder and the wound, in which case recourse is had to a weak hydrochloric solution of pepsin, which liberates formaldehyde from the powder equally as well as the living tissue.

As a hardening agent in microscopy, and for the preservation of vegetable structures, formaldehyde solution promises to be of the greatest service. Mr. E. M. Holmes, F.L.S., read an interesting paper on this subject some months since, and his experience confirms the statements that have been made as to the advantages of

formaldehyde over such solutions as chromic acid and mercuric chloride or even absolute alcohol. Dr. Eccles, writing to the *British Medical Journal*, has stated that, whilst the last-named reagents required a period of time ranging from four or five to fourteen days, and the tissues either became brittle and unequally hardened or the staining was interfered with, those sections treated with formaldehyde were sufficiently hardened in three days, did not become brittle and stained well, the cells retaining their original shape.

A Solution of Formaldehyde Containing	Effects Produced.
1 part in 125,000 parts . .	Kills anthrax bacilli.
" 50,000 " . .	Prevents the development of typhus bacilli, etc.
" 32,000 " . .	Preserves milk for several days.
" 25,000 " . .	Forms a useful injection in leucorrhœa, etc.
" 20,000 " . .	Preserves wines, weak alcoholic liquids and beer, also milk for several weeks.
" 4,000 " . .	Recommended for moistening paper used to cover jam, etc.
" 3,200 " .	For rinsing dairy vessels, etc.
" 2,500 " . .	Destroys the most resistant micro-organism in one hour.
2,000 " . .	For rinsing casks and vessels intended for liquids liable to fermentation.
" 500 " . .	For the irrigation of catheters, etc., and as a mouth-wash.
" 250 to 200 " . .	A general disinfectant solution for washing hands, instruments, etc., in surgery, spraying in sick-rooms and as a deodorant.
" 160 to 100 " . .	For hardening microscopic tissues, which should be immersed for a considerable time to give the best results.
" 100 " . .	In lupus, psoriasis and skin diseases.
" 50 to 25 " . .	Sterilizes surgical catgut, silk, etc., by steeping.
" 25 " . .	For quickly hardening and preserving for microscopical sections; longer immersion in a weaker solution gives better results.
" 10 "	For hardening very firm tissues in pathological and histological work.
" 5 " . .	" firm tissues in pathological and histological work.
" 2½ "	" soft " in pathological and histological work.

The foregoing table gives the purposes for which formaldehyde has been employed, and the proportions recommended. Two and

one-half parts of the 40 per cent. solution may replace each part of formaldehyde.

The practice of employing formaldehyde as a preservative for milk has of late become very general amongst dairymen, with the result that much attention has been directed to methods for its detection. As will be seen from the above table, the proportion necessary is so small that any test to be of service must be exceptionally delicate, and although the qualitative reactions in use do not generally fail in this respect, most of them possess the disadvantage of being common to aldehydes generally. The more important are the following: Ammonio-nitrate of silver, Schiff's reagent, diphenylamine, Hehner's casein-sulphuric test, the phenol-sulphuric test, the chromate test, the micro test with ammonia, and Nessler's reagent.

QUALITATIVE TESTS FOR FORMALDEHYDE.

Ammonio-nitrate of Silver.—This reaction is moderately delicate, but is given by other aldehydes. It will not detect the faint traces which are readily recognizable by Hehner's casein-sulphuric acid and the phenol-sulphuric test. The distillate from many organic liquids gives a slight browning with this reagent which detracts from its usefulness.

Schiff's Reagent (rosaniline, sodium sulphite and hydrochloric acid) is colorless, but with aldehydes gives a reddish violet color. Richmond and Boseley point out that the solution should always contain excess of acid, as alkalis turn it pink, and free acid does not interfere with the violet tint due to aldehyde. According to Hehner the best way of operating is as follows: Distil 25 c.c. from the liquid under examination, place in a stoppered cylinder, and next morning add a few drops of sulphurous acid. The rose color due to oxidation disappears, whilst the violet tint due to aldehyde remains. This test is only useful for confirmation, as it reacts with other aldehydes.

The Diphenylamine Test (Richmond and Boseley).—Distil the liquid, such as milk, etc., into an aqueous solution of diphenylamine, in the preparation of which just sufficient sulphuric acid has been used to effect solution. If formaldehyde be present, a white, flocculent precipitate is deposited, which often has a green tinge. This test is inferior to Hehner's and Schiff's, and is not very delicate.

Hehner's Casein-sulphuric Test.—Add one drop of milk to the sample and pour the mixture carefully on the surface of strong sulphuric acid contained in a test tube. A blue ring appears at the zone of contact when a trace of formaldehyde is present, but the reaction is not obtained with ordinary aldehyde, nor does much formaldehyde give it. Care being taken that the solution is very dilute, this appears to be a thoroughly distinctive test; it is very sensitive, and will detect 1 part of formaldehyde in 200,000. The production of the blue color probably depends on the presence of casein in the milk. In testing milk for formaldehyde, distillation may be avoided by diluting the milk with an equal volume of water and carefully adding sulphuric acid of 90 to 94 per cent. strength. In the absence of formaldehyde a faint greenish tinge appears at the junction of the two liquids, but if present a violet ring is developed.

The Phenol Sulphuric Test is described by O. Hehner[1] as being equally as sensitive and characteristic as the foregoing, with the further recommendation of answering with all proportions of formaldehyde. To the distillate from the sample of milk, or other liquid under examination, add one drop of a dilute aqueous solution of phenol, and pour the mixture on the surface of strong sulphuric acid contained in a test tube. A bright crimson color appears at the line of contact. This detects 1 in 200,000, and if more than 1 in 100,000 be present, there is seen above the red ring a white, milky zone, and, in stronger solution, a white or pinkish precipitate. It is important that only a trace of phenol be used (I find ½ grain to the ounce a suitable strength for the solution) and that the test be carried out exactly as described. A dilute solution of phenol, without formaldehyde, poured on strong sulphuric acid, gives a colored zone, crimson above and green below, therefore excess must be avoided. The colored ring due to formaldehyde is crimson below, merging into yellow above. Acetaldehyde gives an orange precipitate, not a crimson color. Other benzene hydroxy-derivatives may be used in place of phenol, as salicylic acid, resorcinol and pyrogallol; they all yield the red color.

The Chromate Test (C. D. Mitchell).—1 c.c. nitric acid with 1 c.c. of a solution of bichromate of potash forms a reagent which, added

---

[1] *Analyst*, April, 1896.

to the distillate from a liquid containing formaldehyde, produces an intense violet coloration. This does not appear to be a very delicate test, as I have not been able to obtain the reaction with traces of formaldehyde.

Nessler's Reagent gives a distinct yellow precipitate with a solution containing 1 part of formaldehyde in 200,000. It, therefore, lacks nothing in delicacy, and as the reagent is always to be found on the shelves of the pharmacy, it may be recommended as the most convenient test. With solutions of 1 part of formaldehyde in 50,000 to 100,000 a yellowish opalescence first appears, quickly changing into a copious orange precipitate, which, on standing or gently heating, becomes darkened in color and reduced. From 1 in 100,000 to 1 in 200,000 the opalescence develops into a lemon-yellow precipitate on standing, and little or no reduction takes place. The effect produced by formaldehyde is quite distinct from that of a weak solution of ammonia giving about the same depth of color. The latter remains quite clear and transparent even on boiling. With strong solutions of acetaldehyde an orange precipitate and immediate reduction occurs, the same as with formaldehyde, but traces hardly affect Nessler's reagent, and when acetaldehyde is present in sufficient quantity to even communicate its odor to the liquid a yellow precipitate is the only result. The reaction of acetaldehyde with Nessler's reagent is very much less energetic than that of formaldehyde, and there is little risk of confounding the two aldehydes, when traces only are present, such as would be met with in the ordinary course of analysis.

The Ammonia Micro Test (Remijn).—The substance or liquid suspected to contain formaldehyde is distilled with water, a drop of the distillate evaporated on a slide with a drop of ammonia, and the crystalline residue tested with mercuric chloride in excess. Crystals are immediately formed, hexahedral at first, but becoming octahedral after a time. The crystals are easily obtained from a 1 in 10,000 solution, and are visible in a 1 in 100,000 solution. The evaporated residue also gives precipitates with platinic chloride, phosphomolybdic acid and other alkaloidal reagents.

THE QUANTITATIVE DETERMINATION OF FORMALDEHYDE.

There are several methods by which formaldehyde may be quantitatively determined :

(1) The solution may be directly titrated with standard solution of ammonia, rosolic acid being used to indicate the complete conversion of the formaldehyde into hexamethyleneamine.

(2) Excess of standard ammonia having been added, the solution may be titrated back again with standard acid.

(3) The solution may be evaporated to dryness with excess of standard ammonia and the hexamethyleneamine weighed, the formaldehyde being calculated from the following equation:

$$6CH_2O + 4NH_3 = (CH_2)_6N_4 + 6H_2O.$$

(4) The solution containing formaldehyde may be heated for several days in a closed vessel on a water-bath with excess of sodium hydrate; sodium formate and methyl alcohol are produced, and the excess of sodium hydrate is determined by titration with acid (Allen).

(5) The insolubility of the precipitate formed by sulphuric acid, phenol and formaldehyde in the phenol-sulphuric test has led O. Hehner to suggest its utilization for the determination of formaldehyde in dilute solutions. It must be borne in mind that the whole of the formaldehyde cannot be separated by distillation, even when three-fourths of the volume of the liquid containing it has been collected as distillate; the first four of the foregoing methods, therefore, if accurate results be desired, are only applicable to solutions in which no other interfering constituent exists. Some other way of removing the formaldehyde is apparently necessary for its exact quantitative determination in complex mixtures.

ECONOMIC APPLICATIONS OF FORMALDEHYDE.

Formaldehyde, as shown by Slater and Rideal, when employed of such a strength in weak alcoholic liquids as to be fatal to lactic and butyric acid organisms and other bacteria which produce injurious secondary fermentation, does not interfere with the growth of the yeast plant, nor does it hinder in any way the formation of alcohol. This fact has been turned to account in the brewing industry for producing pure cultivations of yeast, and preventing souring, cloudiness, or ropiness in the finished product; it should also prove equally useful in ensuring soundness in such fermented liquids as orange and ginger wines, perry, cider, etc. The proportion necessary is from 1 in 10,000 to 1 in 20,000.

This illustrates a striking peculiarity in the antiseptic action of formaldehyde; for whilst it exerts an intensely powerful inhibitory effect on bacteria generally, especially those of putrefaction, in contrast it has but a comparatively feeble influence in preventing the development of the lower forms of plant life. Hence, vegetable solutions preserved by its aid, although retaining their color and other physical characters to a remarkable degree, are exceedingly prone to develop mouldy growths, etc., and if this is to be avoided, the proportion of antiseptic must be increased to an extent far greater than required to simply arrest putrefactive change.

Meat, fish, etc., may be kept for several days during the hottest weather by placing it in a well-covered dish with a tuft of cotton-wool moistened with from 4 to 8 drops of solution of formaldehyde. The antiseptic vapor does not communicate the slightest odor or taste to the meat, etc., and, after considerable experience of this method, I have never found it fail to maintain the articles absolutely untainted for four or five days, even under the severest conditions of temperature.

Disinfection by formaldehyde vapor generated directly from methylic alcohol has lately attracted considerable attention. The simplest form of apparatus for the purpose consists of an ordinary spirit lamp provided with a coil or spiral of platinum extending about 1 inch above the wick. After lighting the lamp and allowing the platinum to become red hot, the flame is extinguished. The platinum continues to glow in contact with the air and methylic alcohol vapor, and the latter rising from the wick becomes partially converted into formaldehyde, the action being maintained as long as any methyl alcohol remains in the reservoir. In this apparatus, a large proportion of the alcohol escapes oxidation and, in consequence, several improved forms have been devised. In one, resembling a plumber's blow-lamp, a stream of methylic alcohol vapor is directed upon incandescent platinum; there are also air-holes, which can be so adjusted as to regulate the proportions of air and alcohol vapor; in this lamp the greater part of the alcohol is converted. Formaldehyde vapor may also be generated in an apartment by spraying the solution into the atmosphere or heating it in an evaporating dish. Diffusion, however, is slow in the latter case, as has already been stated, and it is much better to allow the solution to fall drop by drop on a heated plate of metal. A handy ar-

rangement for effecting this consists of a tinplate tray supported on the ring of a retort stand, and heated by a spirit lamp, the formaldehyde solution being contained in a glass separator held in an upper ring of the stand, and, by regulation of the stopcock, allowed to drop slowly on to the heated tray beneath. Careful experiment has shown that disinfection with formaldehyde vapor is most thorough and effective, the vapor diffusing very rapidly and penetrating everywhere, dust on the walls, in the air, and even in cupboards, being almost immediately sterilized. Owing to the irritating nature of the formaldehyde fumes on the mucous membrane and air passages, it is imperative that, after disinfection by this means, currents of air should be allowed to pass through the apartment for a quarter of an hour before entering it, whilst complete removal of the disinfectant should be ensured by free ventilation for at least two days.

THE COLORING MATTER OF QUEBRACHO COLORADO.

An investigation of the coloring matter of Quebracho Colorado is reported by Perkin and Gunnell (*Proc. Chem. Society*, 1896, p. 158).

The wood of Quebracho Colorado constitutes the tannin matter "quebracho," which is suitable for the production of morocco leather, and, moreover, in conjunction with alum, it gives the leather a bright yellow shade, instead of the darker colors prepared in the ordinary way. Jean (*Bull. Soc. Chim.*, **33**, 6) found it to contain a tannin differing from those of oak bark and chestnut wood. According to Arnaudon (*Watts' Dict. Chem.*, **8**, 1732), it contains a yellow coloring matter.

The coloring matter $C_{15}H_{10}O_6$ forms glistening yellow needles, dyeing shades similar to those of quercetin, and yielding compounds with mineral acids. The benzoyl derivative $C_{15}H_6O_6(C_7H_5O)_4$ forms colorless needles, having a melting point of 180–181°, and the acetyl derivative $C_{15}H_6O_6(C_2H_3O)_4$ is in the form of colorless needles, melting at 196–198°. Fused with alkali it yields protocatechuic acid and probably resorcinol. Its dyeing properties are found to be identical with those of fisetin, $C_{15}H_{10}O_6$, the coloring matter of young fustic (Rhus cotinus), and there can be little doubt that it is fisetin.

The authors also report the presence of ellagic and gallic acids, which are thought to be formed chiefly during the isolation of the fisetin from the quebracho.

EDITORIAL.

SOME NOTABLE PRESIDENTIAL ADDRESSES.

The season of annual scientific meetings may be said to have recently closed both in this country and in England. Among the great number of addresses which have been delivered, four stand out conspicuously. In this country those of William Trelease, before the Botanical Society of America, and of Nathaniel L. Britton, before Section G of the American Association for the Advancement of Science, are especially worthy of perusal. Dr. Trelease's address, on "Botanical Opportunity," has been printed in full in the *Botanical Gazette* for September. It is not a paper that will bear condensation, but it may be noted that one thing especially is shown which should be a comfort to every struggling botanist, viz.:

> For most of us opportunity of life does not lie in a great and abrupt change of condition, but that it is composed of countless minor chances, which are great only when viewed collectively. To see and use them calls for alert senses, a knowledge and use of the means of ascertaining what has already been done, and, by exclusion, something of what remains to be done, facilities adequate to the task in each case, and indomitable perseverance and ceaseless activity. Great as the value of facilities is, they are merely means to an end. They accomplish nothing themselves. Hence, though it is certain that the most voluminous and, perhaps, the most comprehensive results, and those resulting from the performance of coherent experiments extending through a long series of years, will come from the great centres of research, there is no reason why qualitative results equal to the best may not continue to come as they have in the past, from isolated workers, to the rounding out and completion of whose studies the facilities of the larger institutions will be more and more applicable as the problems of equipment are worked out.

Professor Britton's address before the Botanical Section of the American Association for the Advancement of Science was on the subject of "Botanical Gardens," their origin and development. As might be expected, those of the United States receive a large share of attention. This address was printed in *Science*, September 4th, and in the *Alumni Journal* of the New York College of Pharmacy, for October; it is especially worth the studious attention of botanists.

The foreign addresses are equally noteworthy with those delivered in America, one by Sir Joseph Lister, and the other by Ludwig Mond. The one by Sir Joseph Lister, on "The Interdependence of Science and the Healing Art," was a presidential address before the British Association for the Advancement of Science, and was printed in the *Chemical News* for September 18th and 25th; that by Ludwig Mond appeared in the same journal for September 25th and October 2d, and in the *Pharmaceutical Journal* for September 26th, and was delivered before the Chemical Section of the same Association. It was devoted to "A Brief History of the Manufacture of Chlorine."

Sir Joseph Lister's address naturally covered a range of topics, but from his relation to modern antiseptic surgery, he was in a position to speak as a master, and he did it. On page 612, of this issue, we have printed his remarks on antitoxin, which we believe is a concise and accurate statement of the condition of this subject at the present time. We regret that the other matters touched on by the speaker cannot also be produced here in full, especially the summary of work done by Pasteur.

Ludwig Mond spoke with authority on his subject, and recited a complete

history of the chlorine industry, which necessarily included that of the production of alkali. The rise and development of each one of the various processes, with their defects, were outlined, including the latest electrolytic methods, which he summed up as follows:

Only two electrolytic works, producing chlorine on a really large scale, are in operation to-day. Both electrolyse chloride of potassium, producing as a by-product caustic potash, which is of very much higher value than caustic soda, and of which a larger quantity is obtained for the same amount of current expended. These works are situated in the neighborhood of Stassfurt, the important centre of the chloride of potassium manufacture. The details of the plant they employ are kept secret, but it is known that they use cells with porous diaphragms of special construction, for which great durability is claimed. There are at this time a considerable number of smaller works in existence, or in the course of erection in various countries, intended to carry into practice the production of chlorine by electrolysis by numerous methods, differing mainly in the details of the cells to be used, but some of them also involving what may be called new principles. The most interesting of these are the processes in which mercury is used alternately as kathode and anode, and salt as electrolyte. They aim at obtaining in the first instance chlorine and an amalgam of sodium, and subsequently converting the latter into caustic soda by contact with water, which certainly has the advantage of producing a very pure solution of caustic soda. Mr. Hamilton Castner has carried out this idea most successfully by a very beautiful decomposing cell, which is divided into various compartments, and so arranged that by slightly rocking the cell the mercury is charged with sodium in one compartment, passes into another, where it gives up the sodium to water, and then returns to the first compartment to be recharged with sodium. His process has been at work for some time at Oldbury, near Birmingham, and works for carrying it out on a large scale are now being erected on the banks of the Mersey, and also in Germany and America.

JUBILEE OF ANÆSTHESIA.

In 1846, on the 16th of October, the utility of ether as an anæsthetic in major surgery was demonstrated to the world in the Massachusetts General Hospital, of Boston, by Dr. William T. G. Morton, of that city. Not only has this discovery added to the triumphs of modern surgery, but if all the sufferers who have been benefited by its application could express their gratitude, who can doubt that the occasion would be a jubilee indeed?

On the 16th of October the semi-centennial of the event was celebrated in Boston in the institution in which was first realized the far-reaching possibilities of anæsthesia. That the ceremonies were in every way fitting, may be seen from the following outline:

Address of welcome, by Charles H. Dalton, Esq., President of the Massachusetts General Hospital.

"Reminiscences of 1846," by Dr. R. T. Davis, of Fall River, and Dr. Washington Ayer, of San Francisco.

"Surgery before Anæsthesia," by John Ashhurst, Jr., M.D., of Philadelphia.

"What Anæsthesia Has Done for Surgery," by David W. Cheever, M.D., of Boston.

"Relation of Anæsthesia and Obstetrics," by John P. Reynolds, M.D., of Boston.

"The Influence of Anæsthesia upon Medical Science," by W. H. Welch, M.D., of Baltimore.

"The Surgery of the Future," by Charles McBurney, M.D., of New York.

"The Birth and Death of Pain," a poem, by S. Weir Mitchell, M.D., of Philadelphia.

The humanitarian, no less than the scientific, spirit of the period was shown by the universal interest in the celebration.

However strong the claims of others to priority in this discovery, the claims of Dr. Morton to distinction remain paramount, for he it was who, with that sublime faith in a principle, persisted in experiments, administering ether to himself and others, as well as to the lower animals, until its efficacy was an established fact.

DEATH OF AN EMINENT BOTANIST.

The death of *Baron Ferdinand von Mueller* was reported from Melbourne, Australia, October 9th. Death was attributed to apoplexy. The deceased was born at Rostock, Germany, in 1825. He studied medicine and natural science at the University of Kiel. In 1847 he extensively explored Australia and became Government Botanist of the colony of Victoria in 1852. He has received many honorary decorations and medals, and was elected an honorary member of the Philadelphia College of Pharmacy in April, 1893. Of his numerous contributions to science, his best known was "Select Extra Tropical Plants," the ninth edition of which appeared in 1895.

AN EXPLANATION.

The author of the paper on "Oleomargarine and Wasting Diseases," which we commented on in our October issue, has furnished us with abundant evidence that he was in no way connected with the use made of his paper by a beef-packing house of Chicago for advertising purposes. In clearing himself, however, the author has placed the aforesaid beef-packing house in a very unenviable position, and has shown that what he intended for a strictly scientific paper they garbled so as to make an advertising circular for themselves, and used it without permission.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

NUEVA FARMACOPEA MEXICANA DE LA SOCIEDAD FARMACÉUTICO DE MÉXICO. Tercera Edicion.

Corregida, aumentada y arreglada por los Profesores Alfonso Herrera, Alfonso L. Herrera, Alejandro Uribe, Jose Maria Lasso de la Vega, Manuel F. De Jauregui, Juan B. Calderon, y Severiano Perez, Mexico, 1896.

The second edition of the Mexican Pharmacopœia was extensively reviewed by Professor Maisch in the volumes of this journal for 1885–86; therefore, a detailed notice of the various drugs and their preparations need not be repeated now. The third edition, however, has been considerably enlarged, the volume being a quarto of 589 pages; 195 new articles have been added. The divisions of the work are practically the same as in the former edition, namely, Part I is introductory and contains the tables of weights and measures, reagents, volumetric solutions, etc. Part II is devoted to natural products, vegetable, animal and mineral. This is followed by the Pharmacopœia proper, which is divided into two parts, one being devoted to chemical products and the other to pharmaceutical preparations.

The natural products described in Part II are treated alphabetically and are considered almost as fully as the crude drugs in this country are described in the dispensatories. For example, the description of aconite is subdivided as

follows: Name and natural order, habitat, part employed, physical characters, chemical composition, substitutions, medical properties, dose. As a compact description of the raw materials used in the medicine of Mexico, this part is a decided success.

In admitting chemical products the authors have not allowed themselves to be influenced by such substances having copyrighted names; for instance, we find phenacetine, europhen, exalgine, etc. Some of these remedies, however, have been differently treated, as instanced in the case of antikamnia, which has been placed among the pharmaceutical preparations with a formula, as follows:

Antifebrine	70·00
Sodium bicarbonate	19·50
Caffeine	10·00
Tartaric acid	0·50

Dose, 20 to 60 centigrammes.

Antifebrine is used as a synonym for acetanilid, the latter having a place in the work under chemical products.

There are many new formulas among the pharmaceutical products, most of which reflect credit on those having that portion in charge.

The index is very complete, Spanish, Latin and English titles being included.

The whole is a very creditable work, containing a vast amount of useful information, well worth the careful consideration of both physician and pharmacist.

AN ILLUSTRATED FLORA OF THE NORTHERN UNITED STATES, CANADA AND THE BRITISH POSSESSIONS, from Newfoundland to the Parallel of the Southern Boundary of Virginia, and from the Atlantic Ocean Westward to the One-hundred-and-second Meridian. By Nathaniel Lord Britton, Ph.D., and Hon. Addison Brown. In three volumes. Vol. I, Ophioglossaceæ to Aizoaceæ—Ferns to Carpet Weed. New York: Charles Scribner's Sons. 1896.

The appearance of the first volume of the "Illustrated Flora of North America" marks a distinct advance in systematic botany, and in the literature of that science in America. The enormity of the undertaking to illustrate in this work every known species in the territory whose flora is described, is realized when it is known that upwards of 4,000 species will be thus presented. Illustrations of about three-fourths of these have never before been published. This gives some slight conception of the enormous labor and attention to details necessitated.

The size of the volume (royal 8vo, and pp. 612), style and typography are all commendable. The illustrations are, in most part, drawn from herbarium specimens, and reduced considerably in size in order to get the work into the compact sphere necessitated by the desire to make this work the standard guide for collectors and all students of our flora. Despite the facts of reduction in size and the absence of coloring, the plants are admirably presented by line drawings. The stems are frequently shown as if doubled or cut, as they often appear in herbarium specimens, and the illustrations of the characteristic structural features of the species are especially to be commended.

The drawings of such characters as the scales in Gramineæ, and the achenes and bristles in illustrating the Cyperaceæ, are generally well executed, and

will greatly enhance the value of the work to the students of these difficult groups. No matter how carefully the descriptions are worded, the idea is impressed more positively and permanently by illustration.

The order of presentation of subjects is in accordance with the classification adopted by Engler and Prantl in *Natürliche Pflanzenfamilien*, and now very generally followed in the recent floras of European publication, the sequence being from plants of simple structure to those of the more complex. Excellent keys are provided to aid the student in analysing plants.

The volume before us commences with the Pteridophyta, and this sub-kingdom is considered in 48 pages. In the sub-kingdom Spermatophyta, the Gymnospermæ are first considered, and Pinaceæ replaces Coniferæ as the name of the Pine family.

The assistance of such able specialists as Porter, Bicknell, Underwood, Coville, Small, Nash, Scribner, Sheldon and the late Rev. Thos. Morong, adds additional authority to the volume.

The rules of nomenclature of the Botanical Club of the American Association for the Advancement of Science are rigidly adhered to, even to the acceptance of such binomials as Fagopyrum Fagopyrum, Corallorhiza Corallorhiza, Phegopteris Phegopteris, Hystrix Hystrix, etc. It is fortunate that such binomials are not very numerous. The many changes in names necessitated by the law of priority are here given, and, accompanied by the extensive synonymy, will render the work invaluable to a host of botanists who want to follow a standard authority, and have neither time nor desire to make a special study of synonymy and priority.

The accentuation of both generic and specific names is carefully noted in each instance, in accordance with the rules laid down in the introduction. Popular English names are given for each species, and where several names are used locally for the same plant, the most desirable is selected, or, where a good popular name does not exist, a suitable name is coined. While such names are not essential to the botanist, it behooves us to exert our influence in favor of having correct popular names universally adopted.

The geographical distribution for each species is carefully noted, and in some cases the authorities for such statements are quoted. The limits of altitude are, wherever possible, given, and this is a feature which, heretofore, has not received proper consideration in American botanies.

This work should tend to greatly popularize the study of plants. The price, $3, is very moderate for such a comprehensive volume, and every botanist should subscribe at once for it, so as to encourage the authors and publishers to promptly issue the remaining two volumes. We await their appearance, convinced in advance that they will merit the same welcome and approval that Volume I has received. G. M. B.

A Manual of Materia Medica and Pharmacology. By David M. R. Culbreth, Ph.G., M.D., Professor of Botany, Materia Medica and Pharmacognosy in the Maryland College of Pharmacy. Lea Bros. & Co., Philadelphia and New York. 1896. Pp. 818.

Part I is devoted to organic drugs from the vegetable kingdom, and constitutes the bulk of the book, or 555 pages. Part II treats of organic drugs from the animal kingdom. Part III is devoted to inorganic drugs from the mineral

kingdom. Part IV considers organic carbon compounds. Part V discusses non-pharmacopœial organic carbon compounds. Part VI is devoted to the microscope and its use in materia medica.

The book, as a whole, has many features that will recommend it to the pharmacist and student. A considerable amount of space is devoted to some general subjects, like definitions of pharmaceutical terms and of classes of preparations, as vinegars, waters, etc., the avenues by and through which medicines enter the system, incompatibility, and some other topics not often found in books for pharmacists.

Part I opens with the Ranunculaceæ. The order of treating each is somewhat different from that in a number of other works on this subject. The Latin and English names of the drug are first given, then botanical origin, part employed, synonyms, description of the plant yielding the drug, adulterations, constituents, preparations, properties and uses, followed in many cases by a description of allied plants or drugs.

Numerous tabular recapitulations, occupying two adjacent pages, are distributed through the book, which will be of assistance to the student in making comparative studies.

The book is fully illustrated, and in a manner to be of advantage to the student, although a few inaccuracies of illustration may be observed, notably the one of Quercus alba, which only resembles that species in the shape of the acorns; the other characters bear a close resemblance to the European Quercus pedunculata. It is doubtful whether the extremes of variation allowed the oaks ever produced a white oak like the illustration; certainly it is not typical.

It may be said of Part III, devoted to inorganic drugs from the mineral kingdom, that the author has made the most out of a condensation of such a vast amount of material into a little over 100 pages.

The closing part of the book, devoted to a consideration of the microscope and its accessories, will be found of use to all who wish to have a true knowledge of botany and materia medica, that is a knowledge founded on observation instead of temporarily on memory alone.

BOTANY (Phanerogams and Vascular Cryptogams). By Baron F. von Mueller and Professor Ralph Tate. Reprinted from *Transactions of Royal Society*, South Australia, Vol. 16.

PROCEEDINGS OF THE PENNSYLVANIA PHARMACEUTICAL ASSOCIATION. Nineteenth annual meeting, at Mt. Holly Springs, Pa., June 16–18, 1896.

PROCEEDINGS OF THE TENNESSEE STATE DRUGGISTS' ASSOCIATION. Eleventh annual meeting, at Chickamauga, Tenn., July 15–16, 1896.

ESSAI DES MÉDICAMENTS NOUVEAUX. Par Et. Fayn. Extrait du *Journal de Pharmacie d'Anvers.*

The author considers it of the greatest importance that pharmacists should know the properties and methods of preparing the numerous new substances which are forced upon him. He has, therefore, given the name and synonyms, preparation, physical properties, solubilities, therapeutics and dose, and method of assaying a number of the best known new compounds. Working formulas for substances like bismuth subgallate, glycerophosphate of calcium, salipyrine, etc., are given in full.

ON TRIMETAPHOSPHIMIC ACID AND ITS DECOMPOSITION PRODUCTS. By H. N. Stokes. Reprinted from *American Chemical Journal*, October, 1896. This paper describes the third member of the metaphosphimic acid series, and details its decomposition products. It is shortly to be followed by an account of tetrametaphosphimic acid.

REPORT OF THE WORK OF THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNIVERSITY OF CALIFORNIA FOR 1894–95.

This report is a valuable one, and a number of illustrations add to its interest. Some of the subjects may be noted. Under the head of "Starch in Buckeye Fruit (Æsculus Californica)" are given results of an analysis which show that the buckeye fruit contains a much lower percentage of starch than either corn or potatoes, and is, therefore, not as rich a material for the manufacture of this substance as has been supposed. The portion entitled "Examination of Licorice Roots" we give in full on page 636, of this number of the JOURNAL. Considerable space is devoted to "The Canaigre or Tanners' Dock."

PROCEEDINGS OF THE THIRTEENTH ANNUAL CONVENTION OF THE NATIONAL CONFECTIONERS' ASSOCIATION OF THE UNITED STATES, held at Cleveland, July 9 and 10, 1896.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, October 20, 1896.

The first of the series of Pharmaceutical Meetings of the Philadelphia College of Pharmacy for 1896–97 was held in the College Museum, with Prof. Samuel P. Sadtler in the chair.

The reading of the minutes of the last meeting having been dispensed with, the next in order was the reading of original communications. The programme embraced an interesting variety of subjects, the first of which was "A History of the Pharmaceutical Meetings of the Philadelphia College of Pharmacy," by Thomas S. Wiegand (see p. 605). The original plan of conducting these meetings has undergone but little change since their inauguration. It was early determined not to introduce matters of a business character; and at a meeting of the College, September 27, 1842, an amendment to the by-laws, providing that the pharmaceutical meetings should be limited exclusively to scientific subjects, was adopted. Perhaps, in no better way can the benefits which have accrued to American pharmacy from these meetings be judged than by the fact that over 500 papers have been reported through their instrumentality.

The discussion which followed the paper was mainly reminiscent.

"Antimonii Oxidum and Pulvis Antimonialis," was the subject of a paper by Charles H. LaWall (see page 597).

The author gave the official history of these drugs and described the various processes which have been used for their manufacture. The higher oxides of antimony were also considered, together with test methods for distinguishing them. Six samples of the oxide in question were analyzed, and three methods

for determining the percentage of antimony were employed in each case. Of four samples obtained in the market, one was found to be stibic acid, another was inferior in appearance, but answered the other requirements fairly well, and two were U.S.P. in every respect.

Mr. J. W. England stated that the antimonial compounds were not used nearly so much as formerly, and that tartar emetic was chiefly employed in making wine of antimony. He attributed their decline in the favor of physicians to their variability in composition, and said that the antimonous oxide, which most frequently enters into the composition of the other preparations, was often contaminated with antimonic oxide, and was consequently of a dangerous character.

Dr. C. B. Lowe thought that another reason for their disuse was the fact that formerly they were used in surgical practice to produce nausea and relaxation prior to operations, and this method having been superseded by the use of anæsthetics, their employment has diminished.

A paper by Mr. England was announced on the programme, but he reported that his results, which were not yet ready, would be given at a future meeting.

A highly interesting and instructive paper, entitled "A Botanical Excursion to Mexico," was presented by John W. Harshberger, of the University of Pennsylvania (see page 588).

Dr. Harshberger found the plateau upon which the city of Mexico is located a rich and unique field for the study of botany. He said that the plants in this region might be grouped into a number of communities, and that within a radius of a few miles, owing to certain physical and meteorological conditions, were found representatives of the aquatic, alpine, desert and tropical floras and that thus was afforded an excellent opportunity for the study of plants with reference to environment. Accompanying this paper were a collection of herbarium specimens, including the flowers of several species of native dahlias, and also growing specimens of two species of the century plant, Agave megalacantha and Agave Americana.

A contribution on "The Tannin of Some Acorns" was read by Prof. Henry Trimble (see page 601).

It was found that the testa or thin membrane surrounding the cotyledons was the part of the acorn containing the highest percentage of tannin, that of Quercus Prinus yielding from 42·10 to 48·09 per cent. The cupule (which is the most easily utilized for the production of tannin) of this species contained from 13·37 to 18·20 per cent. The cupules of several other species were also examined, and the percentages were found to range from 4·55 to 5·27 in Quercus rubra to 12·66 in Quercus coccinea. A photograph of a fruiting branch of Quercus alba was shown.

An exhibition of quite a number of specimens added considerably to the interest of the meeting. Among them were kinos from four species of Eucalyptus and an exudation from Xanthorrhœa Preissii, which were sent by Baron Ferd. von Mueller, of Melbourne, Australia.

The barks of four species of Castanopsis and of two species of Quercus, sent by Mr. H. N. Ridley, of the Botanic Gardens of Singapore, India. Prof. Trimble said, in describing these specimens, that, botanically, Castanopsis is intermediate in character between the chestnut and oak, and that it has only one representative in this country. A fine section of Pareira brava and a specimen

of wood, supposed to be from a species of Quebracho, were presented by Mr. LaWall. A sample of Mexican cacao beans was the gift of Mr. F. M. Tilton, this of city; and a souvenir of the Jury of Awards of the Atlanta Exposition, 1895, was donated by Prof. Trimble.

On motion of Dr. Lowe, a unanimous vote of thanks was tendered Dr. Harshberger for the narration of his trip to Mexico, and to the donors of the specimens.

On motion, the meeting adjourned.

T. S. WIEGAND,
Registrar.

MINUTES OF MEETING OF COLLEGE MEMBERS.

PHILADELPHIA, September 28, 1896.

The stated quarterly meeting was held this day, at 4 o'clock P.M. William J. Jenks presided. Seventeen members were present.

The minutes of the last stated meeting were read and adopted; also the minutes of proceedings of the Board of Trustees for September were read and, on motion, approved.

Prof. Trimble read a report of the delegates of this College to the sessions of the American Pharmaceutical Association, held at Montreal, in August last, in purport as follows: "The meeting was satisfactory in result. Less time was expended in discussing the educational question, and, consequently, more stress given to the numerous papers on scientific and miscellaneous subjects. The social entertainment was highly enjoyed, and the details admirably conducted."

Prof. Remington also referred verbally to the meeting, saying that whilst the subject of coincident education—that is, shop training and technical instruction (college teaching)—was not openly discussed, yet it remains an unsettled question, and there was much significance in the voluntary opinions of leading and prominent pharmacists, as published in the columns of the public journals—notably, the *American Druggist*—a summary of which shows an almost unanimous preference for the practical training of the shop as a preliminary to the theoretical education which the college provides.

Prof. Trimble presented a copy of the Pharmacopœia Mexicana, received from the hands of Dr. Alfonso Herrera, as a contribution to the Library of the College. On motion, the Secretary was instructed to transmit an expression of the thanks of the members to the donor.

Dr. A. W. Miller, Corresponding Secretary, read a communication from Mr. J. H. Maiden, of Sydney, New South Wales, stating that he had succeeded, by appointment, to the office of Government Botanist, *vice* Mr. Charles Moore, F.L.S., who had retired after nearly half a century of service.

The following-named gentlemen were elected Trustees for the three years next ensuing: Prof. Henry Trimble, Geo. M. Beringer and Jos. W. England.

On motion, the meeting adjourned.

WILLIAM B. THOMPSON,
Secretary.

NOTES AND NEWS.

Vermilion is prepared in the wet way by adding lime water to a solution of corrosive sublimate and to the resulting precipitate sodium thiosulphate until solution is effected and the liquid has assumed a yellow color. If it is now heated to 70°–80°, mercuric sulphide separates as a fiery red powder.—*Pharm. Post*, 1896, p. 322.

Examination of Licorice Roots.[1]—The undried samples were received from Ant. C. Denotovich, of Fresno, Cal., who calculated that they would, when dry, show a shrinkage of about 55 per cent. They were grown on the "white ash" land of the San Joaquin Valley, near Fresno. A careful examination gave the following results:

	Per Cent.
Extract in the "green" or fresh roots	22·80
Extract in the air-dried sample	42·22
Total Sugar in the "extract"	17·00
[2] Glycyrrhizin in the "extract"	14·70

Licorice has been grown on a large scale for some time by parties near Stockton, on partly sandy, partly adobe land, also in the Garden of Economic Plants, of the University of California, for ten or more years, and does well. The only question in its culture is the commercial one as to whether it can be profitably grown with our expensive labor, in competition with Europe and Asia Minor. There are millions of acres of soil well adapted to the culture, both in California and Oregon, where a native species, also with a sweet root, grows wild and is a great pest in certain soils. The licorice plant becomes a weed when allowed to escape from cultivation in certain favorable soils. The wild licorice of this country is very largely found on alkali land.

Composition of Goose-fat. J. Rozsenyi. (*Ber. Chem. Inst. Buda Pest*; through *Zeit. ang. Chem.*, 1896, 364.) The following constants were obtained with four samples of goose-fat rendered by the author:

	1.	2.	3.	4.
Specific gravity (15°)	0·9229	0·9258	0·9228	0·9300
Melting point { commenced	26·6°	30·0°	29·5°	29·5°
Melting point { ended	27·5°	31·4°	31·7°	31·0°
Solidification point	18·4°	18·3°	18·1°	18·1°
Melting point, fatty acids { commenced	35·2°	35·3°	39·0°	—
Melting point, fatty acids { ended	36·6°	37·5°	40·2°	—
Iodine number	58·7	62·8	66·4	62·5
Reichert-Meissl number	0·3	0·3	0·3	0·2
Köttstorfer number	193·0	191·2	191·6	193·0
Hehner number	94·5	95·3	95·1	—
Refractive index at 40° (Zeiss)	50·5	50·0	50·5	50·5

—*The Analyst*, Vol. 21, No. 246.

[1] Report of work of the Agricultural Experiment Stations of the University of California for the year 1894–95.

[2] Determined by method given in Vol. II, *Nahrungs- und Genussmittel*, by König, p. 751.

THE AMERICAN JOURNAL OF PHARMACY

DECEMBER, 1896.

AMERICAN PHARMACOPŒIAS AND DISPENSATORIES.[1]

By John Uri Lloyd.

The following list, with brief descriptions, embraces the record of American Pharmacopœias and Dispensatories to 1890, so far as the writer can determine. The original intention was to complete the subject by incorporating therewith a list of American Materia Medicas, Formularies, works on pharmacy and allied sciences, such as medical botany and medical materia medica. However, it became evident that these in themselves were more than enough for a journal contribution, and hence they were left for another occasion. In some instances difficulty was experienced in properly classifying the publications, since titles do not always serve as a proper means of classification. For this reason some publications reserved for other sections might, perhaps, more justly be included in the list herewith presented.

The record is made up from the contents of the Lloyd Library, but the list has been compared with such catalogues as that of the Surgeon General's Library, which is not as complete as our own in works of this description, and it is not likely that many prominent oversights have been made. Any information concerning omissions will be thankfully received. It should be added that homœopathic works are not herein included, for the reason that the library is not as yet complete enough in this direction to do justice to such publications.

---

[1] Read at the November Meeting of the Cincinnati Section of the American Chemical Society.

AMERICAN PHARMACOPŒIAS.[1]

1778.—The first American Pharmacopœia was issued in 1778. It was titled "Pharmacopœia Simpliciorum et Efficaciorum," etc., and was published for the United States Hospital, Lititz, Lancaster County, Pa. The work is in Latin, contains thirty-two pages, the text occupying 4½ x 2½ inches. It is in two sections, the first section being devoted to "Medicamenta Interna;" the second section, to "Medicamenta Externa seu Chirurgica." A second edition was issued in 1781, this being presented by Mr. Chas. A. Heinitsch to the Philadelphia College of Pharmacy.

In this (second) edition the name W. Brown, M.D., author, is found on the title-page, but it is absent from the first edition. A reprint of this work appeared in the AM. JOUR. PHARM., September, 1884.

1808.—The second book issued in America under the name "Pharmacopœia," was by the Massachusetts Medical Society, in 1808. This was "prepared conformably to a vote of the Counsellors, passed on the third day of October, 1805." This volume is beautifully printed (Boston, 272 pages), contains both an English and a Latin index, posological and prosodial table of ancient names, with their synonyms, and a table of systematic names and their synonyms. This book cannot but excite admiration, and the reviewer regrets that space will not permit him to dwell at length upon some phases of its contents.

1820.—The first issue of the Pharmacopœia of the United States appeared in 1820 from the press of Wells & Lilly, Boston. It contained 272 pages, and was printed in both English and Latin. A second edition was issued in 1828. All subsequent revisions were in English only.

Owing to internal dissensions, two Pharmacopœias were issued in 1830, one (176 pages) from New York, the other (268 pages) from Philadelphia. Subsequent revisions were as follows:

[1] Hospital Formularies (excepting 1778) are omitted.

Convention of	2d	Revision,	1840 (279 pages), was issued from Philadelphia.
"	" 3d	"	1850 (317 pages), was issued from Philadelphia.[1]
"	" 4th	"	1860 (399 pages), was issued from Philadelphia.
"	" 5th	"	1870 (383 pages), was issued from Philadelphia.
"	" 6th	"	1880 (488 pages), was issued from New York.
"	" 7th	"	1890 (602 pages), was issued from Philadelphia.

1822.—Dr. Jacob Bigelow issued "A treatise containing 422 pages, intended as a sequel to the Pharmacopœia of the United States." This book is somewhat of the nature of a Dispensatory confined to Pharmacopœial drugs.

1880.—Dr. Chas. Rice presented a Report (199 pages) on the Revision of the United States Pharmacopœia; this work was titled "General Principles, Titles and Working Formulæ Prepared for the Next Pharmacopœia."

1881.—"An Unofficial Pharmacopœia," etc. By Prof. Oscar Oldberg. This work of 503 pages is largely devoted to the Metric System; Part I, 59 pages, being "The Metric System;" and Part III, 134 pages, being titled "Metric Prescription Formulary." The tables and rules for conversion of metric weights and measures into other systems are very complete. Possibly, I should have placed this work among the Formularies.

1889.—The Pharmacopœial Committee issued a "Digest of Criticisms of the Sixth Decennial Revision," Part I containing 189 pages, Part II containing 86 pages. Part III dated 1890 containing 335 pages.

1892.—The Pharmacopœial Committee issued a pamphlet (40 pages) on "Reagents and Volumetric Solutions Proposed for the U. S. Pharmacopœia."

AMERICAN DISPENSATORIES.

1806.—The first American Dispensatory was issued by Dr. John Redman Coxe, of Philadelphia, in 1806. It was titled "The American Dispensatory." There were nine editions, the last appearing in 1831. Its text and contents are clear and concise.

1810.—The second American Dispensatory was issued by Dr. James Thacher, of Plymouth, Mass., in 1810, under the auspices of

[1] In 1855 a second edition of 1850 Pharmacopœia was issued, the first edition having been exhausted. This, as stated in the preface, was "printed in a smaller and less expensive form," but the committee did not "consider themselves authorized to make additions or considerable changes." The writer considers himself fortunate in possessing the interleaved autograph copy of Prof. Wm. Procter, freely interspersed with his personal criticisms, donated by his son, Wallace Procter.

the Massachusetts Medical Society. Its basis was the newly issued Pharmacopœia of the same society (which, as already said, was the first American Pharmacopœia, 1808), and was dedicated to John Warren, one of the committee on revision of that work. This Dispensatory was issued from Boston, and titled "The American New Dispensatory," etc. It contained 529 pages, the contents reminding one forcibly of the Dispensatories of to-day. It was revised and enlarged four times, the fourth edition appearing in 1821.

1827.—"The Eclectic and General Dispensatory" appeared in Philadelphia from an anonymous author, the title-page simply carrying the information that it is "by an American physician." The book contains 624 pages and a supplement of lithographic plates and apparatus. This book had no connection in any way with modern eclecticism.

1833.—The first edition of the "Dispensatory of the United States of America," by Dr. George B. Wood and Dr. Franklin Bache, Philadelphia, appeared in 1833. It contained 1,073 pages, and considered only the official drugs and preparations. In 1834, the second edition (1,162 pages) was issued, to which was added an appendix, in two parts, the first part consisting of "Drugs and Medicines not Officinal," the second being devoted to the "Art of Prescribing Medicines." Following these, new editions preceding 1890 were issued as follows:

3d edition	1836
4th "	1839
5th "	1843
6th "	1845
7th "	1847
8th "	1849
9th "	1851
10th "	1854
11th "	1858
12th "	1865
13th "	1875
14th "	1877
15th "	1883
16th "	1889

After the fourteenth edition, the work was continued by Dr. H. C. Wood, Prof. Joseph P. Remington and Prof. S. P. Sadtler.

1848.—"A Dispensatory and Therapeutical Remembrancer, second edition," by John Mayne (England). Revised by Dr. R. Eglesfeld

Griffith, Philadelphia, with the addition of "Formulæ of the United States Pharmacopœia." This book, of 329 pages, is wholly devoted to medicinal preparations and the therapy of pharmacopœial drugs.

1852.—The first edition of "The Eclectic Dispensatory," by Dr. John King and Dr. Robert S. Newton, 708 pages, was issued in 1852. An injunction against this book was taken by the proprietors of the "United States Dispensatory," which was finally upheld by the Courts, and, in consequence, Dr. King was compelled to destroy his plates and pay the owners of the "United States Dispensatory" a large amount of money. In all, the expense to King was over $6,000. The next edition (1854) appeared under the name of "The American Eclectic Dispensatory," by Dr. John King, which title was subsequently changed to "The American Dispensatory." In 1880 a supplement of 202 pages was added, by Dr. John King and J. U. Lloyd. In all, sixteen editions of this Dispensatory have appeared, there having been three revisions.

1869.—"The Physio-Medical Dispensatory," 832 pages, by Dr. Wm. H. Cook, Cincinnati. This work is authority with the followers of Samuel Thomson, and is a very interesting publication. This school of medicine (physio-medical) excludes poisons from its materia medica and has many advocates in the middle West.

1878.—"The Dispensatory and Pharmacopœia of North America and Great Britain," 620 pages, by Dr. John Buchanan and Dr. John T. Siggins, Philadelphia, 1878. This book, so far as the face of the text is concerned, reminds one of the 1880 edition of the United States Pharmacopœia, but the resemblance extends no further than the face of the type. The author, Dr. Buchanan, of Philadelphia, should not be confused with Dr. Jos. R. Buchanan, formerly of Boston, now residing at San José, Cal. No subsequent edition appeared.

1879.—The first edition of "The National Dispensatory," 1,628 pages, by Dr. Alfred Stillé and Prof. John M. Maisch, appeared in 1879, Philadelphia. The contents were arranged alphabetically by sections, the General Index being supported by a Therapeutical Index. The second edition appeared in 1880, the third edition in 1884, the fourth edition in 1889. At the death of Prof. Maisch, the work was revised by Dr. Alfred Stillé, Prof. Chas. Caspari, Jr., and Henry C. C. Maisch, the name of Prof. John M. Maisch remaining on the title-page.

A CONTRIBUTION TO THE KNOWLEDGE OF SOME NORTH AMERICAN CONIFERÆ.

By Edson S. Bastin and Henry Trimble.

(*Continued from page 566.*)

GENERAL CHARACTERS OF THE GENUS TSUGA.

Only about seven species of the genus Tsuga are known, two, or perhaps three, of these belong to Japan, two to western North America and two to eastern North America. The west American species are T. Mertensiana, Carriere; T. Pattoniana, Brewer and Watson; and the east American species are T. Canadensis, Carriere, and T. Caroliniana, Engelmann. All of the species are large trees of graceful habit, and they are closely allied to one another, except T. Pattoniana, which is aberrant in some of its characters, approaching more closely in its structure to the pines and spruces.

The hemlocks are all evergreen trees, with slender, spreading branches, which are mostly horizontal or drooping; with flat, horizontally spreading, alternate leaves, which, by the direction they take, appear two-ranked or pectinate; they have short, green petioles, which are inserted on slight elevations on the branches. The staminate flowers are sub-globose and axillary; the anthers are two-celled and transversely dehiscent; the pollen-grains are simple. The cones terminate the branchlets of the preceding year; mature their seeds the first year; are pendulous, ovoid or oblong in form; of small size, with thin, scarcely woody scales that are two-seeded, obtuse and persistent. The seeds are provided with wings.

TSUGA CANADENSIS, CARR.

HEMLOCK.

DISTRIBUTION AND GENERAL CHARACTERS.

The common hemlock of eastern North America is very abundant in many localities, sometimes to the exclusion of all other trees. It is also rather widely distributed, ranging northward through Nova Scotia and New Brunswick, and through the regions bordering on the St. Lawrence and the Great Lakes; it occurs in all the Eastern and Middle States, extends westward to the eastern border of Minnesota, and follows the Alleghanies southward through

BRANCH OF TSUGA CANADENSIS.

Maryland, the Virginias, North Carolina and Tennessee to Georgia and Alabama.

It is a tree of large size, attaining a height of 110 feet and a diameter of 4 feet. It is sometimes found in low ground, where the

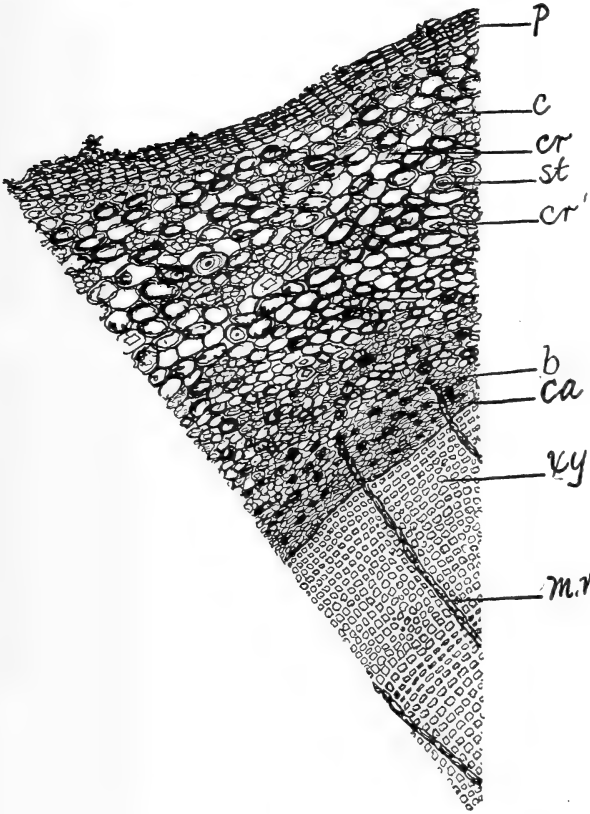


Fig. 52.—Small part of cross-section of twig, two years old, of Tsuga Canadensis, magnified 75 diameters. *P*, periderm ; *c*, small parenchyma cells of cortex ; *cr*, *cr'*, crystal cells ; *st*, stone cells of middle bark ; *b*, bast layer ; *ca*, cambium ; *xy*, xylem ; *mr*, medullary ray containing tannin.

soil is deep and rich ; but it occurs more commonly on rocky hill- or mountain-sides, especially along northern exposures. Its wood is of low specific gravity, brittle and neither very strong nor very durable, but it is much used for lumber. The tree is beautiful in

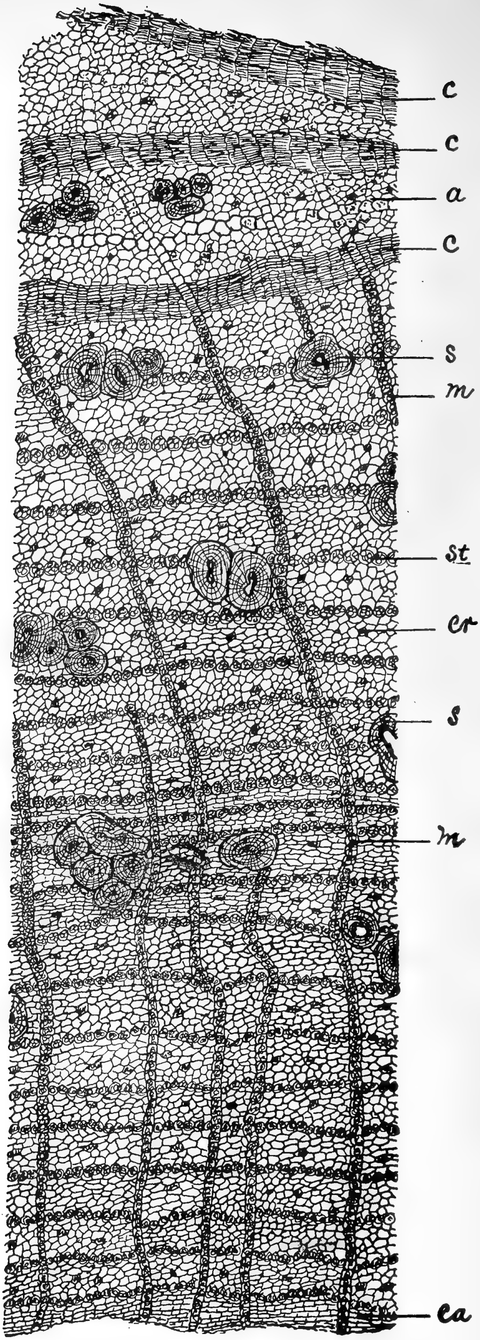


Fig. 53.—Small portion of cross-section of bark of Tsuga Canadensis, magnified about 50 diameters. *c, c, c,* secondary cork formation; *a,* dead phloem tissues rich in coloring, resin and tannic matters; *s, s,* stone cells; *m, m,* medullary rays; *cr,* crystal cell; *ca,* cambium; *st,* bands of starch-bearing parenchyma cells.

form and in its light, delicate spray, and is therefore much cultivated for ornament.

MICROSCOPICAL STRUCTURE.

The cross-section of a twig of two years' growth, *Fig. 52*, showed at the outside an epidermis already mostly displaced by periderm formations. Beneath the periderm layer was a cortex composed of parenchyma cells of small or moderate size, thickly interspersed

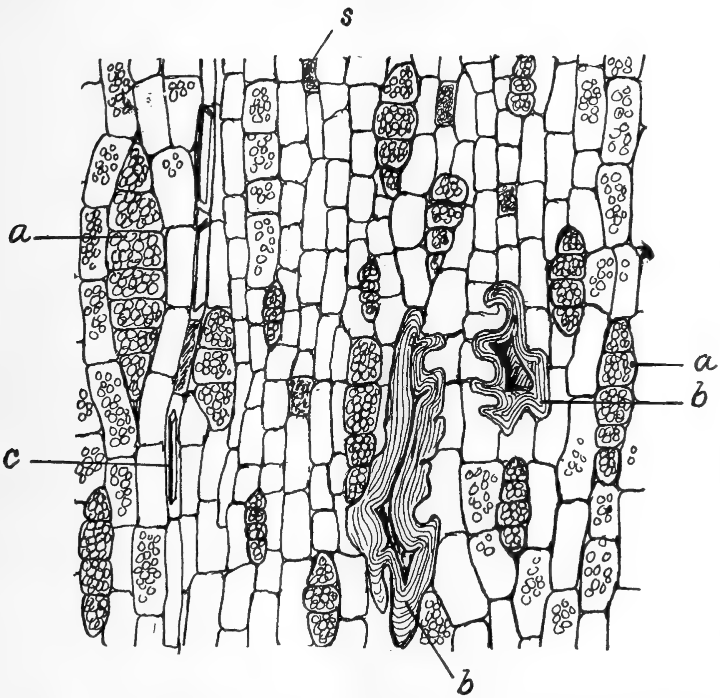


Fig. 54.—Small portion of longitudinal-tangential section of the inner bark of Tsuga Canadensis, magnified about 75 diameters. *a, a*, medullary rays, the cells containing much starch; *b, b*, stone cells; *c*, row of cells containing crystals of calcium oxalate; *s*, cell containing oleoresinous secretion.

with much larger ones. The latter contained either tannin or mucilage, or both. There were also many cells containing crystals, and scattering stone cells, occurring singly or in clusters of a few. The bast layer likewise contained numerous tannin cells, and these, as viewed in transverse section, were larger than the other cells of this layer. Many of the medullary-ray cells and cells of the pith con-

tained tannin in abundance. Secretion reservoirs were not present in the wood.

Sections of the older bark of this species were studied, and a description published some time ago in this JOURNAL (July, 1895, p. 356). Some of the facts and illustrations are here reproduced. It was shown, *Fig. 53*, that successive periderms were formed, finally invading the inner layer of the bark. These bands of cork were very deep purple, and the coloring matter which they contained was bleached out of them with great difficulty, even by means of Labarraque's solution. The dead parenchymatous tissues between these were also seen to be strongly colored, but the coloring matter was discharged from them more readily. Whether this was due to the greater impenetrability of the corky bands to solvents, or to differences in the chemical nature of the coloring matters, has not been determined. Tests applied seem to indicate that the newly formed bast contained less of tannic matters than the earlier formed parts. Stone cells of large size, and often quite irregular in shape, were scattered without order through all but the youngest portions of the bast layer. It has already been shown that stone cells occur in the middle bark as well.

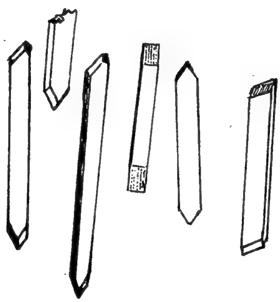


Fig. 55.—A few of the crystals, magnified 230 diameters.

The bark of the specimens examined contained considerable starch, the tangential rows of large cells occurring at frequent and rather regular intervals in the bast layer, being especially rich in small grains.

The medullary rays were seen to be narrow, being but one cell broad, and in longitudinal-tangential section, appearing as a fusiform

cluster from three to about seven cells long. The cells of the medullary rays were observed also to contain much starch.

The leaves of this hemlock are, when young, of a fine light green color, which, at maturity, changes into a deep but still vivid green. In form they are linear, from one-half to three-fourths of an inch long, and about one-sixteenth to one-twelfth of an inch wide, obtuse at the apex, contracted below into short green petioles about one-twenty-fifth of an inch in length; these readily break away, on drying, from the elevations on the stem on which they are inserted;

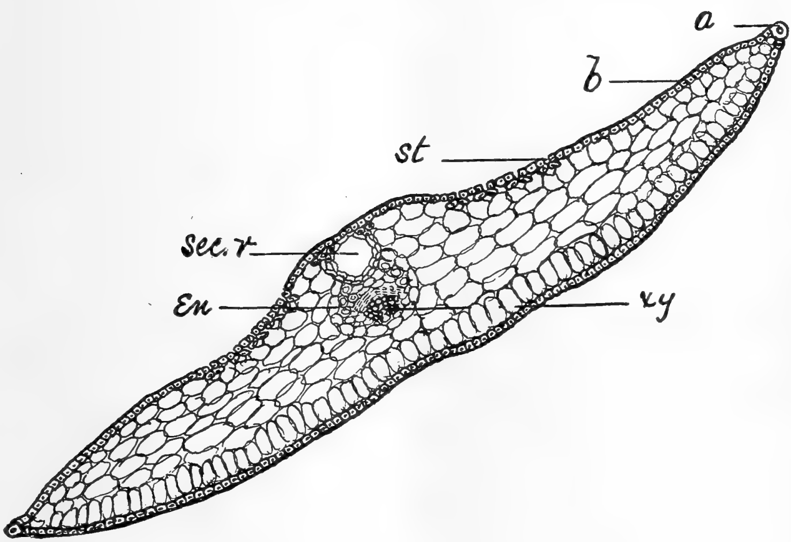


Fig. 56.—Cross-section of leaf of Tsuga Canadensis, magnified about 65 diameters. *A*, large epidermal cell at margin of leaf; *b*, thick-walled epidermis of under surface; *st*, one of the stomata; *sec. r.*, secretion reservoir between mid-rib and lower epidermis; *en*, endodermis; *xy*, xylem.

the margins of the blade are roughened by sharp, anteriorly inclined, rather distant teeth. The upper surface is smooth and deep green, while the lower surface is glaucous-white on each side of the mid-rib. These glaucous areas indicate the position of the crowded stomata arranged in longitudinal lines, about six lines on each side of the mid-rib. The rows, however, are commonly more or less interrupted. A considerable area of the under surface adjacent to the margin is free from stomata, as well as the whole of the upper surface.

A cross-section *Fig. 56*, showed, a thick-walled epidermis, not supported by a sclerenchymatous hypoderma; an epidermal cell at each edge conspicuously larger than the rest; a distinct palisade tissue on the upper side, composed of a layer of large cells slightly elongated in a direction vertical to the epidermis; a more loosely arranged interior parenchyma, also large-celled, and having the cells mostly elongated in a direction parallel to the epidermis and perpendicular to the mid-rib. All of the mesophyll cells were plain-walled and contained, besides protoplasm and chlorophyll-bodies, abundance of tannin; the endodermis was rather large-celled, with walls but little thickened, the cells forming a circle, except for an indentation on the under side, where pressed against by the large secretion reservoir which lies between the mid-rib and the lower epidermis. There were no other secretion reservoirs observed in the leaf The endodermis enclosed a thin area of transfusion tissue, in which was embedded a small, double, fibro-vascular bundle, similar in other respects to those which occur in the leaves of the pines and firs.

(*To be continued.*)

EDIBLE AND NON-EDIBLE MUSHROOMS AND FUNGI.[1]

By Charles McIlvaine.

My principal object to-day will be to interest you in the immense field that is everywhere about you in the study of toadstool life, and in endeavoring to induce you to so study their habits that you may bring your skill and experience to bear upon the cultivation of very many of the wild varieties, assuring you that the field is virtually an unoccupied one, and that success will redound to your honor and profit.

The many and expensive books upon fungi are excellent in their classification and description of toadstools; but their authors, through following one another in assertions and lack of original investigation, falsify their edible and non-edible qualities.

The books are, therefore, of little use in designating which can be eaten and which can not.

Here let me say that I prefer to call all visible fungi—excepting the common mushroom—by their popular name—toadstools—

[1] An address delivered at a pharmaceutical meeting, held at the Philadelphia College of Pharmacy, November 18, 1896.

though a toad never sat upon one, unless he lit there at the end of one of his acrobatic eccentricities.

Nearly all of these books are of foreign origin—most of them English. It may be that the proverbial care of an Englishman for his stomach has something to do with the fear of adding to his bill of fare by experimentation, or it may be that his moral excellence is too great; for I invariably find that the better a person believes himself prepared to die, the more afraid he is to eat toadstools.

Be this as it may, it has been left to Americans to correct the errors of foreign authors, and to largely increase the list of edible toadstools. More than this, it is due to their confirmation, that the poisonous varieties have been segregated from the succulent, and that the certain antidote to the deadly alkaloid which exists in a few of a limited genus has been named.

The interest in toadstools as a useful article of food has been steadily increasing in this country for about thirty years. During the War of the Rebellion, Dr. Curtis, of North Carolina, tested 111 varieties, and published a descriptive list of them, that the soldiers of the Confederacy might benefit from the excellent, healthy food, ever ready at their feet, wherever post was established or a camp-fire lighted.

Later, Mr. Julius A. Palmer, of Boston, published a handsome colored chart of "The Mushrooms of America," showing about twenty kinds. Unfortunately, this chart is, in many respects, incorrect.

Mr. R. K. Macadam, of Boston, has devoted ten years to completing a correct descriptive and comparative list of over 2,000 species of the Hymenomycetes, together with over 7,000 references, found in this country—a stupendous work accomplished quietly by a methodical business man for the love of science alone. Dr. Taylor, Chief of the Bureau of Microscopy, Agricultural Department United States, issued five pamphlets upon the subject. The object was good, the step in the right direction, but the information largely retains the errors of the books.

Prof. Charles H. Peck, New York State Botanist, has done and is doing the most valuable identifying and classifying work ever done on this side of the Atlantic. His labors are published annually in the reports of the New York State Museum of Natural History.

Quite recently, the accomplished artist and author, Mr. Wm. Hamilton Gibson, has brought out the first important and, by far, the most sumptuous American book upon mushrooms and toadstools. It describes and delineates about thirty species, edible and poisonous. I have now in course of preparation a text-book of American species, which will concisely describe most of them, and will state, from my own experience, their edible or non-edible qualities.

In 1881, an accident—an extensive fire, which swept a vast region among the mountains of West Virginia and blackened the wooded sides—revealed to me, as I rode on horseback over the charred mat, the many varieties and enormous quantity of toadstools everywhere studding ground and tree. They were so clean, so beautiful, so luscious-looking, that I said to myself: "There must be varieties among these which can be eaten. Certainly the common mushroom which my father gathered on the Springton Meadows, and I helped eat with boyish gusto, is not the only fungus fit for food." The first instinct of an old soldier kindled the shout: "Something to eat," and the unvaried bill of fare at the native's log cabin where I lodged, of potatoes and bacon, bacon and potatoes, was lengthened by the addition of anticipated delicacies. By smell, taste and appetizing scrunity, I selected a species which, in every way, invited me to a feast. It was golden yellow, lily-shaped but foliated, white in flesh, veined on the outside, and seductive in the smell of ripe apricots. It grew in fascinating clusters, where beech trees mottled the ground with shadow, or pin oaks allowed warm share of sunlight. Filling my saddle pockets I took them home, cooked a mess, ate it, and, in spite of the prophecy of a frightened family, did not die. The species eaten was the Cantharellus cibarius, a modified form of the Agaricini, a gilled family, the English Free Mason's glory at St. John's Day dinner—the one of which the old botanist Tratinick says: "Not only this same fungus never did any one harm, but might even restore the dead." It grows on the margins of and within the depths of almost every woods in Pennsylvania.

This was the beginning. By careful selection, careful testing, careful eating, I added fifteen or twenty kinds to my bill of fare, by the time Mr. Lloyd P. Smith, then Librarian of the Philadelphia Library, had kindly sent to me Dr. Badham's illustrated book on English fungi. Upon studying it, what was my astonishment to

find that I ought to have been several times poisoned by what I had eaten. Denouncing the old doctor as no good, I obtained, with great difficulty, other books upon the subject. They contained the same startling information. Determining that much error existed in the standard works upon fungi; that toadstools were a much slandered and grossly defamed growth; that here was an open field for investigation and discovery, which would amply repay me in good meals and absorbing interest, I pursued my experiments in eating of them, until, to-day, I have increased the list of edible fungi to 437 kinds, and the work is not yet finished.

I mention this bit of economic and gastronomic history simply to show that persistent, systematic investigation among Nature's products, even in forbidden fields, yields rich reward.

I do not propose to tell you of all the edible kinds, or of all that I ascertained to be poisonous, noxious, undesirable in flavor, or indigestible because of toughness; but to mention the several orders and prominent genera in which both edible and non-edible species are found; to describe the most plentiful varieties, and direct you how to go about determining for yourselves which are edible and which are not; and, as far as my experience goes, suggest plans for the cultivation of the desirable species.

Among fungi, the Hymenomycetes is an order which has the hymenium or seed-bearing surface exposed. It is among the Hymenomycetes that the edible toadstools are principally found. The order is divided into six sub-orders: the Agaricini, in which the seed or spore-bearing surface is spread over gills or modifications of the same; the Polyporei, where it lines tubes; the Hydnei, where it covers teeth or protuberances of many forms; the Thelephoreæ, where it is horizontal and mostly on the under surface; the Clavariei, upon which it is vertical and over the entire surface; and the Tremellini, where it surmounts and surrounds a gelatinous mass, commonly called fairy butter.

The first of these sub-orders, the Agaricini, so-called after the Agari of Sarmatia, contains by far the greatest number of species. Its individuals are found growing everywhere and upon almost everything. Its genera have special habitats, and are as contrary about living there, and there only, as the proverbial Berkshire pig.

The genera are divided into series, determined by the color of their spores. The first genus is Agaricus; the first of the white-

spored series is Amanita. Standing at the very summit of fungoid growth; stately, brilliant, exquisite; like Rappicini's daughter, terrible as beautiful, it fascinates but to slay.

In this genus, Amanita, are found the only toadstools whose poison is fatal to man. Thousands have been their victims. Composed as it is of not over thirty species, it deals, alike, in death and sustenance. Eight of the species are deadly, the others are not only innocuous, but are unsurpassed by any toadstool in delicacy and deliciousness. There are toadstools which contain minor poisons, acrid resins and substances which upset the digestive apparatus, whose evil effects are easily remedied by an emetic, then a wineglassful of sweet oil and whiskey, or vinegar; but other than the eight species of the Amanitæ, none are deadly.

Until 1885 the antidote to amanitine poisoning had been indicated only. In that year there were five cases of toadstool poisoning in a family resident in Shenandoah, Pa. By quick work I was enabled to get specimens of the toadstools eaten. Among them I found the Amanita vernus. Two of the family died; three were saved by the intelligent treatment of the family physician—Dr. Shadle. Noting that the poison present was narcotic and acting upon the nerve centres, especially the one governing the heart, he administered atropine heavily, thus saving the three. I knew the toadstool causing the poisoning; in Dr. Shadle's treatment I had the antidote. After-experiments upon myself and animals enabled me to confirm it. I announced it to the world in the columns of the *Medical and Surgical Reporter*, of this city. For the first time atropine was known to be the antidote to amanitine.

On the first appearance of symptoms of amanitine poisoning—gray pallor, faint breath, thickened tongue, violent retching, $\frac{1}{90}$ of a grain of atropine should be administered hypodermically. This should be continued, heroically, until the $\frac{1}{20}$ of a grain is injected, or the patient cured. Emetics are worse than useless.

I would not dwell so long upon the Amanita, nor tell you this, if I did not feel it my bounden duty before by speech or pen interesting persons in toadstools as a food, and their study as a valuable one, to first carefully caution against the Amanitæ, hoist the danger signal, and give knowledge of the remedy if, through ignorance or mistake, one of the poisonous kind is eaten.

A piece as big as a pea will kill a human being as dead as a door-nail. Charles Dickens says: "The wisdom of our ancestors is in the simile"—or I would not use it.

There is no charm, no test, no plan of cooking—which will detect or destroy the poisonous alkaloid, or announce danger in a single variety of the Amanita. In letting the whole genus alone, or in botanic knowledge of its members, is the only safety.

I will describe them. When quite young they are egg-shaped and entirely enclosed within a white sheath. The top of this sheath is pushed upward through the ground by rapid cell-formation within it. It is knob-shaped. In this stage it much resembles the common mushroom, and in mistaking it for the latter is the cause of so many deaths.

This knob increases in size, is thrust upward by the stem beneath it, ruptures the sheath, begins to expand, carrying patches of it on what now becomes the top or cap of the growth. These patches either dry and remain there or are evanescent—disappearing. The stem elongates; the cap expands to hemispherical shape. Reaching from the edge of the cap to the stem, and fastened to it, is a white, thin, kid-like membrane, called a veil. Its object is to shield the seed-bearing surface which it covers from the attacks of enemies. As the cap expands from the hemispherical to umbrella shape, it stretches this veil until it breaks away from the edge or circumference. A fringe of it often adheres to the cap; the body of it collapses about the stem and either remains there, pendulous, in the form of a ring, or, later, if the veil was very thin, as simply a stain.

The plant is now fully grown. It has scabs, or warts, or stains upon the otherwise smooth, kid-like cap, unless the remnants of the sheath are evanescent. The cap may be snow-white, greenish, yellowish, orange, purple, brown—almost any color. Underneath the cap, which has pure white flesh, without unpleasant taste, but smelling faintly of polecat, are (with one exception, where they are yellow) white gills, radiating from, but not quite reaching the point at which the stem enters the cap. The cap is easily separable from the stem. If it is laid gills downward upon a sheet of paper, and a tumbler placed over it to prevent drying, it will shed thousands of white spores. The stem is generally long, round, slightly expanded at the top, but gradually thickens downward until it reaches the sheath from which it sprung; here it is more

or less bulbous. The sheath is in the ground. The ruptured parts remain about the base of the stem as a volva, unless they, too, are evanescent; in such an event there is a remaining stain or a mark, showing where the sheath was adnate or attached.

The scabs or warts, the ring or veil, the sheath or volva are the distinguishing marks of the Amanita. They should be kept well in mind, and a let-alone doubt about the presence of any one of them should rule. The Amanitæ all grow upon the ground. Their habitat is in the woods, or under trees, or where a clearing has been recently made.

The common mushroom never grows in the woods. Remembering this, the collector will not eat of supposed mushrooms found in woods, and may thus save his family the unpleasant necessity for a coroner's inquest.

Again, the gills of the common mushroom are pink, or dark brownish purple; spores purple. The edible Amanita have the same marks as the poisonous. They can be distinguished only by accurate knowledge of their individual appearance, just as you distinguish roses, apples, potatoes, and, without hesitating, name them, noting their comparative goodness.

If by any chance a species of toadstool should be eaten which produces unpleasant effects within three or four hours, one can surely know that one of the minor poisons is at work; for poisoning by the Amanita does not exhibit a single symptom under from eight to ten hours after eating.

So much for the Amanitæ. I leave the genus with the skull and cross-bones upon it.

Next to it comes the sub-genus, Lepiota, from a very crooked Greek word, meaning a scale. It is closely allied to the Amanita, but the sheath at the base of the stem is always absent. The volva, which covered it in youth, is concrete with the skin of the cap, and remains there permanently attached as scales, warts or fuzzy tufts, but that part which was at the base is absorbed by it. The ring is manifest; in some species it is movable. The gills are white and distant from the stem, which rests in a socket in the cap and is easily detached. Many of the larger ones are delicious. I know of none which appeal to the pleasurable senses that are noxious. Some are too strong to be enjoyable.

Most of the species grow from the ground; several are found in

hot-houses; some grow from sawdust, spent tan and like mediums. There is one species—the Vittadini—a large, white plant, covered with floccy drapery, growing solitary in the woods, which is said to be poisonous. I have never found but one specimen, and, so, have not yet tested it. It is an intermediate, and should be relegated to the Amanita. There are over thirty species of the Lepiota.

Some mycologists have separated from the Amanita a few species which do not have the ring, but retain the volva in the shape of a vagina, clinging close to the not bulbous stem, and made a new sub-genus—Vaginatus. Most of you are familiar with a slender-stemmed, tall, bluish-gray capped toadstool, quite Quakerish in appearance, showing a ribbed or sulcate surface on the top, which grows singly on lawns, under willows, oaks, chestnuts and in the woods. This species is the Vaginatus Cecilia. It is tender as choice asparagus and more delicate in flavor. Another species, more robust than the Cecilia, but like it in all respects, excepting its bright chestnut-colored cap, is equally as fine eating.

In the genus Tricholoma there are between 80 and 100 species, none of which are noxious; most of them are excellent; a few are uninviting to sight, taste and smell. The mark distinguishing this from all the white-spored genera is that the gills are sinuate—that is, connected with the stem by a sinus—a tooth.

The sub-genus Clitocybe, meaning steep declivity, because the stem dilates at and is continuous with the top; the gills are, therefore, attenuated behind, acute, adnate or decurrent, never sinuate. They grow upon the ground. Notwithstanding that the books say: "very few are edible," very many of the upwards of seventy-five species are good as any; others are tough; some strong in taste and odor. I do not believe there is a poisonous species among them.

Another sub-genus, the Collybia—meaning a small coin—numbers in the neighborhood of seventy-five species. The stems have cartilaginous cuticle and are rooting. They grow upon wood, leaves, even fungi. The caps of many of them are very fine eating. None of them contain even minor poisons. Some are tough, others strong. One species, which is often found upon wooded lawns, with an attractive mouse-colored top, very wide white gills, tall, thin stem, and very long pointed root—the Longipes—is as good as any.

I pass the several sub-genera, containing the smaller-sized species, until we reach the Pleurotus, from two Greek words, meaning a side and an ear. These grow in clusters, and rarely upon the ground; the most familiar one to you is the Ostreatus, or oyster toadstool, which is very common from early spring until far into the winter. It is especially fond of poplar logs, and the stumps of poplar and hickory. It grows from a side stem, and is found in dense, overlapping clusters, very closely resembling the oyster in color; the gills are white, sometimes slightly tinged with yellow on the edges, and the whole plant has a sweet, spicy smell.

The very young specimens, or the old ones when the tough part near the stem is removed, make a delicious stew, but require slow cooking for half an hour. I have frequently found large clusters in midwinter by following the tracks of cows in the snow upon the West Virginia mountains, when I noticed them leaving the main trail of the herd. They evidently form part of the Materia Medica of cows, and are detected at as much as the distance of 100 yards by scent alone; for at this distance from the main trail I have noticed where cows have scented them, gone directly to them and pawed them up from under snow eighteen inches deep. They do not eat the entire fungus, but break it up with their hoofs and scatter portions of it over the snow. I had a similar experience near Springton Forge, in Chester County, Pa.

Cows break up, in like manner, the large Lycoperdon giganteum.

The Pleurotus ulmarius, which grows only upon the elm tree and in the autumn, often attaining a diameter of 1 foot, is common where elm trees are plenty. I have seen the trees in Boston Common loaded with them. The tender parts of them, after long cooking, are reasonably good; but if not sufficiently cooked are as tough as saddle-flaps. None of them are poisonous, several are excellent, many are too tough to be used for food. There are over half a hundred species.

A large genus, the Lactarius (from *lac*, milk), is known by its exuding milk when the stems or caps are broken. Many of this species are esculent; none of them are poisonous; several of them are large, white and showy; with two exceptions they grow from the ground; they are found in the woods in great quantity. There is one large species, the Piperatus, which is quite common. On tasting it one is disposed to think that spontaneous combustion has

suddenly occurred in one's mouth. All mycologists give it a bad reputation, and name it among the deadly poisonous fungi. I have had more pen-fights over it than a few. I have eaten it dozens of times, and have fed my family on it without other than pleasant results. It loses its fiery qualities on cooking, and, though a coarse species, is much more tender and quite as savory as many of the vegetables we eat. They, together with many other toadstools, are found in such plenty that they become an easily gathered and valuable fertilizer. Containing, as they do, a large amount of nitrogenous matter, the gathering of them is worth the attention of agriculturists and horticulturists.

By far the most numerous sub-genera of the Agaricini is the Russula, meaning reddish. They are the peasants among toadstools, and dot the ground thickly, from early spring to Autumn, wherever leaf-mould or shaded sod affords their beloved habitat. Standing on their single stem—thin, thick or corpulent, with tops of many hues and shapes, gills straight, even and brittle—they are the most independent and sturdy of fungoid growth. Most of them are sweet and nutty to the taste; some are hot as the fieriest of Cayenne, but this they lose upon cooking. To this genus authors have done especial injustice; there is not a single poisonous species among them, and, where they are not too strong of annisette and other highly flavored spices, they are all edible; most of them are among my favorites. Where they present no objectionable appearance or taste, their caps make most palatable dishes when stewed, baked, roasted or escallopped. Here let me say that, in cooking all varieties of toadstools, they should be cooked precisely as is the oyster. The time of cooking should be determined by the consistency of the variety; some will cook in five minutes, others not under thirty. Salt, pepper and butter are the only necessaries as seasoning. The aim should be to preserve as nearly as possible the natural flavor. It is culinary heresy to soak them with gravies or smother them with foreign flavors.

If the Russula could be grown artificially, it would be far more popular and profitable than the common mushroom, but it is harder to move from its natural settlements than the North American Indian. It has been claimed by mushroom growers, until within the last few years, that the spores of the mushroom have to pass through the digestive apparatus of the horse before they will germinate. My

friend, Mr. S. Edward Paschall, formerly of Doylestown, now of West Chester, than whom no one knows more about what a mushroom will and will not do, and who, by his indefatigable labor and persistent experiments, has succeeded in making an American spawn, which is more productive and quicker in fruiting than the best imported spawn from either England or France, has conclusively demonstrated that such a transmission is not a necessity. It was for a long time my opinion—following the opinion of others—that such assistance was necessary. In my many efforts to propagate valuable food species of the wild toadstools, I endeavored to find the method by which the spores were disseminated, and through what digestive medium they passed—either of insect or animal—before germination. Noticing that the Russulæ were fed upon by a small black beetle, I planted in suitable places, not the toadstools, but the beetles found upon them. The result was that in several instances I grew the Russulæ. My experiments, while interesting, are not conclusive, because I later found that the same results could be obtained from the toadstool itself when planted under its own natural life conditions.

The beetles known as tumbler-bugs deposit eggs in the centre of balls made of animal droppings; dig a hole in the ground and dump them into it. These droppings frequently contain the spores of the meadow mushroom. Thus planted with the proper surrounding of manure, and at the proper depth, the spores germinate, spread mycelium, and a crop of mushrooms is the result. The beetle becomes a horticulturist. No wonder the Egyptians, thousands of years ago, made it—the scarabus—their sacred emblem, and that, to-day, the *fleur-de-lis* of France, so the Rosicrucians say, perpetuates its glorious worth and calling.

While upon the subject of toadstool propagation, there are several species which will amply repay the attention of horticulturists. My experiments, but few of which were successful, have thus far shown me that the line of success lies in assisting toadstools in disseminating their spores and mycelium within territory and conditions natural to them. The Lepiota procerus—the parasol toadstool I have described—can be grown in quantity by tramping the ripe spores into where old wood piles have been, and into leaf mould on the margins of woods. The Cantharellus cibarius, also described, and one of the most prolific, weight-giving, palatable toadstools there

is, can be easily increased by transplanting the mycelium within the immediate region in which it is found. Enormous crops could thus be raised without other attention. They keep a long while after gathering—in fact, are readily dried for winter use. They carry in bulk, are the most attractive of all toadstools when displayed, and, once introduced into our markets, will be eagerly sought for at good prices.

The sub-genera and species I have described, you will remember, are all of the Agaricini and all white-spored. In the series having pink, brown, purple and black spores there are genera corrresponding to those of the white-spored series, with the exception of the Amanita and a few others. In these genera are many excellent esculent species. The time allotted me prevents describing them. I will, therefore, dwell only upon the purple and black-spored toadstools, they being in many of their varieties of greater interest to the horticulturist.

The common mushroom is an Agaric, bearing purple spores upon its gills. Its method of artificial propagation is well known to all of you. First what is called virgin spawn is made. This is obtained by taking the scrapings of public roads, spots where horses have stood on fair grounds, from the well-trodden mill-tracks about horse-driven grinding machines, and like places. This is mixed with a carefully prepared medium of horse manure, and left to stand at a carefully regulated temperature. The spores contained in the scrapings germinate, throw out the mycelium, which permeates the entire mass. When it has thus done, its further development is stopped by pressing the mass into bricks, and by gentle heat driving all moisture from them. These bricks then contain what is called virgin spawn. The spawn of commerce is either made from these bricks, or from inserting pieces of the virgin spawn into masses of a like prepared medium. The spawn or mycelium runs through the additional mass, is again stopped in its growth, and bricks are made from it. It is evident that the nearer to virgin spawn, the purer and better the crop of mushrooms produced from it will be. The production of mushroom spawn is an important industry in England and France. Large quantities of it are imported to this country by our well-known seedsmen, and sold to mushroom raisers. The importance of procuring good spawn is equal to the procuring of the best seed, or plant, or any other cultivated growth.

Success in raising mushrooms depends largely upon the proper treatment of the manure intended for mushroom beds, and upon preserving a certain uniform temperature.

There is another genus among the Pratelli, or purple-spored series, called Hypholoma, meaning web-fringe. Its members grow on wood in groups, often in fasciculate, overlapping masses. The books say: "The species are not edible, the tough ones being bitter, and the fragile ones almost devoid of flesh." I wish to draw your attention particularly to this genus, because it contains several members which I believe, when known, will equal if not exceed all others in economic value.

Most of them are found in the woods, growing from or about stumps or decaying roots in the ground; frequently they protrude in great clusters from around the base of posts. The several species vary in shades of yellow and brown; their caps are from 1 to 6 inches across; their stems are short or long, as the number in the cluster permits; there is a floccose veil, or remnants of one, about the stem; the gills are greenish, olivaceous or greenish shades of yellow. They are showy and easily recognized. They are found from September until mid-winter; I have gathered them when frozen as hard as—well, the first biscuit of a maiden's make. The flesh is solid, white or yellowish; the taste is acrid, or bitter, or saponaceous. Patches of them—and they are frequent in almost every woods in the land—often yield several bushels. Thousands of tons of them annually go to waste. When a bunch of them is found, cut the caps off carefully without pulling up the stems, which latter destroys many young ones and injures the mycelium. Brush the caps off; lay them gills downward in your basket, as you should always do any fungus intended for the table, to prevent dirt from getting among the gills, from which no amount of washing will dislodge it. Cut the caps in pieces after washing, and stew, or bake with bread crumbs, for half an hour. Season, and when nearly done put in a little lemon-juice—never vinegar—or, better still, a little sherry or Madeira. You will have a feast fit for the gods—hardly a fair fitness; for I suspect that, were the old gods to cut up their old-time capers now, their fare would be that of our prisons.

As a pickle, these varieties of the Hypholoma have no superior. Country people have an immense, healthy, never-failing food supply at hand for the gathering. They can be dried for winter use.

The black-spored series, the Coprinarii, from a scratchy-looking Greek word, meaning dung, are more familiar to the horticulturist than any other, because they inhabit their manure and compost heaps, and are abundant upon the droppings in the fields. They are the scavengers of the toadstool family. Yet among them are found the most tender, toothsome kinds. The little brown capped, black-gilled, slender-stemmed Coprinus micaceus, whose tops frequently glisten as if sprinkled with fine mica, is a great favorite with all mycophagists, which outlandish word means toadstool eaters. From early spring until frost they grow singly, or in inviting clusters upon manured lawns, about yard posts, from gutter sides, and, generally, where there is rich living for them. Though small, seldom over an inch in diameter, their plentifulness soon fills the collector's basket. They make a rich, black dish, after ten minutes' stewing. At one time I almost lived on those I gathered along the street sides of Haddonfield; but I have taught so many friends their lusciousness, that the ungrateful wretches now rob me of my food supply. When once a person is inoculated with the virus of toadstool eating, all gratitude, friendship, even family ties vanish, and he or she will race for an edible toadstool, if but seen through a telescope.

The Coprinus comatus, or maned toadstool, is plentiful in our markets after summer rains. It is sold under the name of truffle. The truffle grows under ground. It has never been found in America, and has resisted all efforts made to naturalize it as a denizen. The Coprinus comatus grows in dense clusters, from ashes and dumpage, or places rich in salts of lime or potash. It is oval in shape, coated with revolute scales in concentric rings, is maned on the edges of the cap by fragments of the veil, has black gills, and, like most of the Coprinarii, deliquesces into an inky fluid. Both caps and stems are fine eating. It is very prolific and, I have no doubt, can be cultivated by transplanting the mycelium. Early in the spring, you will find many small, brown-topped toadstools, not larger than a ten-cent piece, scattered all over your lawns and grassy fields. Gather the tops and eat them without fear; they are luscious. All the black-spored species are innocuous, excepting one, which is a rapid and effectual intoxicant.

It is the C. papilonaceus. It grows from dung, is about 3 inches high, caps hemispherical and coated with scales when dry,

which gives it a variegated or butterfly appearance, hence its name. The gills are very broad and blackish. It is quite common from July to November. No cheaper or more effectual spree is by Nature provided.

In the order of Hydnei, having teeth-like protuberances upon which the spores are born, there are a few edible varieties. Their occurrence is not frequent in this section of the country. Among them is the Hydnei repandum, which grows upon the ground, and some of the Medusa-like growths found upon trees; they are sufficiently tender for food; the others are too tough.

The order Polyporei (*χdūι-ī*), having tubes in which the spores are produced, and from whose many mouths they are shed, includes many delicate and valuable species in its first sub-genus, Boletus. They all grow upon the ground; none of them are poisonous. One —the Boletus felleus, a large, handsome, brown-topped fungus—is excessively bitter; this bitterness does not leave it on cooking and renders it unpalatable. The Boleti are found in great quantities in woods and on their margins. There are over seventy species. When they appeal to the eye, and are not water-soaked or wormy, they make tasty meals. The tubes are detachable and should be removed from the long-tubed species. Cook half an hour, broil, fry or roast like chestnuts. The species of Polyporus, seen growing everywhere upon trees and fallen branches, are too woody to masticate, excepting the Fistulina hepatica, or liver fungus, which grows from stumps and the decaying crannies in trees. It is superior to any tenderloin ever cooked. It resembles, somewhat, a calf's tongue, but I have seen it a foot and more in width. I have tried to cultivate it by planting pieces of it in stumps, but have not yet had a single result other than disappointment. I believe it can be done, and it is well worth persistent effort. When we can grow such excellent steaks from stumps, beef will be cheaper.

The Clavarerei grow from the ground, generally in woods, and are frequently branched like deer horns. They cannot be mistaken. None are poisonous. Many make the most savory of stews. Some are tough as shoe-strings. They are often found in large patches and tufts. They could be used as the mallow and Iceland moss are in confections.

The Lycoperdons, or puff balls, are numerous in species. They are all edible when the flesh is white, not tinged with yellow, or

water-soaked. Cut in slices, fried or stewed, they are remarkably tender and of delicate flavor. In one genus—the Scleroderma—is found the Scleroderma vulgare. It is very plentiful under beeches and along the rooted banks of rivulets. In size it resembles a walnut. Its skin is brown and rough. When quite young, the flesh—solid as a potato—is white. It then changes to purple, and finally to a deep black, in its granulated appearance resembling gunpowder. As long as it remains solid it is good eating, but must be well cooked.

I am compelled to pass hundreds of species to which I would like to draw your attention; the field is too large to cover with a single paper. If I have succeeded in interesting you in the vast food supply which invites your investigation and cultivation, I have done a good thing for you, and have removed somewhat of the stigma which attaches to my little friends—the toadstools.

I have seen, this year, a large and paying crop of mushrooms grown on a meadow where pieces of spawn had been inserted in the sod. This inserting should be done after the spring rains are over, and the dry season well set in. Too much moisture will invariably kill spawn. The horticulturist will have ample remuneration from spawning unshaded ground.

GLYCERITE OF LICORICE.

By Joseph W. England.

Probably the most generally popular products used to mask the taste of bitter and nauseous drugs, given in liquid form, are to be found in preparations made from licorice root, despite the fact that none of them, as at present made, are fully representative, or free from objectionable features. The notoriously variable quality of commercial extract of licorice is an open secret. The fluid extract is acrid from the resin dissolved by the alcohol of the menstruum used in making it. The official "pure extract" does not have the pure licorice flavor, and is apt to become mouldy. The purified extract of the "National Formulary," intended doubtless to replace the well-known "Succus Liquoritiæ" of commerce, is the best product of all, but its merits are marred by a "strawy" taste, the probable presence of vegetable spores and the absence of definite strength. Ammoniated glycyrrhizin no more represents the full

flavor of pure licorice extract than do a few grains of caffeine a cup of good coffee. It is entirely odorless. That licorice root yields volatile principles is well known, especially to those who reside in the vicinity of licorice-extract-making establishments, where, for squares around, the atmosphere is laden with the odors of boiling licorice solutions.

It is obvious, then, that a satisfactory liquid licorice preparation should be one holding in solution all the desirable soluble proximate principles, free from acrid resin or other undesirable products, of full odor and taste, and standardized to a definite strength. These results the writer has endeavored to obtain by the following process:

Take of:

Powdered extract of licorice	8 troy ounces.
Water	32 fluid ounces.
Ammonia water	1 fluid ounce.
Glycerine, a sufficient quantity.	

Sift the powdered extract of licorice upon the water and water of ammonia contained in a capacious agate-ware pan, dissolve as far as possible and pour the mixture upon a specially prepared sand-bed (to be hereinafter described) contained in a half-gallon glass funnel. Let stand for twelve hours, or over night, collecting percolate. Then, with a small porcelain capsule, remove the gelatinized, starchy mass that has formed upon the surface of the sand-bed. Add water and continue the percolation until the soluble matter in the bed has been practically washed out. Mix percolates, note volume in fluid ounces, evaporate 1 fluid ounce on a water-bath to a constant weight, weigh, estimate the number of grains contained in the reserved percolates, and divide by 240 to obtain the number of fluid ounces of a 50 per cent. by volume solution that can be made. Then, by means of a sand-bath, carefully evaporate the reserved percolates down to *three-fourths* of the estimated volume, and add sufficient glycerin to make up the volume. Care must be used, especially during the latter part of the evaporation, that the product be frequently stirred and not be too highly heated, as it is then very readily scorched. If, during evaporation, turbidity should occur as a result of too long a heating, clearness may be restored with a few drops of ammonia water.

While the evaporation of percolates is proceeding, another lot of

the licorice extract mixture may be percolated through the *same* sand-bed, and the process duplicated, or a larger sand-bed may be used and the process followed on a larger scale. Doubtless, working on an extended scale, the sand-bed could be made quite large; steam heat, with a vacuum apparatus, could be employed, and working details could be profitably modified.

Ammonia water is added to the licorice extract mixture to bring into solution the uncombined glycyrrhizin of the powdered extract. The excess of ammonia water is eliminated by the after-heating.

The success of the process depends upon the manipulation of the sand-bed and the carefulness with which the percolates are evaporated. To prepare the sand for the bed, take fairly coarse washed bar sand, and remove sticks, stones, etc., with a No. 20 sieve. Clean the sieved portions thoroughly with washings of boiling water, and dry, heating strongly. To make the bed, place a flat piece of absorbent cotton, wetted on the under side, in the bottom of the funnel and fill the latter with the cleaned sand to within an inch or two of the top. If a larger glass funnel be used, it need not be filled quite so full, but, to a degree, the broader the surface of the sand-bed used, the better the results. Percolation commences quickly, but slows up in a short time. If the first portions of percolate be turbid, they should be returned to the funnel.

The gelatinized, starchy mass that is formed upon the surface of the sand-bed is sometimes an inch or more deep. It is nearly black from the presence of a portion of the soluble principles of the extract. But the amount of the latter is of no practical moment, and is compensated for by the subsequent standardization. By removing the gelatinized mass before continuing percolation, the latter is made much more easy. With care, the same sand-bed may be used for a number of operations.

With the formula above mentioned, the mixed percolates obtained by the writer amounted to about 40 fluid ounces. More than this makes no practical difference, as the solution is standardized, but it is desirable to have as small a volume as possible, in order to diminish the time of evaporation, and reduce the danger of an empyreumatic product.

The powdered extracts used by the writer averaged 40 per cent. of insoluble matter. The amount usually allowed by manufacturers is 35 per cent., but the percentage varies according to the age at

which the roots have been gathered; the younger the roots the more starch they contain, and the more insoluble matter there is in the extract made from them. In some countries, young and old roots are gathered indiscriminately; in others the older or mature roots alone are collected. With a powdered extract of licorice containing more than 40 per cent. of soluble matter dissolved in the quantity of water mentioned in the above formula, it is obvious that a more dense solution would result, and it is probable that the formula given would need some modification—more water and a larger sand bed, for instance.

The standardization of the mixed percolates is a simple matter. Assuming, for example, that we have 41 fluid ounces of percolates, and that 1 fluid ounce has been found to contain 60 grains of anhydrous extract, it is evident that there are 2,400 grains of extract in the 40 fluid ounces reserved, a quantity sufficient to make 10 fluid ounces of a glycerite of licorice containing 240 grains to the fluid ounce. Then, if the product is to contain 25 per cent. by volume of glycerin, it will only be necessary to evaporate the 40 fluid ounces down to 7½ fluid ounces, and add the glycerin.

The product as thus made is a black, syrupy liquid, having the characteristic odor and taste of pure licorice. It is different in physical properties from the usual preparations, being free from any objectionable taste or ingredient, and standardized to a definite strength. It seems to be permanent in keeping qualities, samples made by the writer several months ago having remained unchanged.

Syrup of licorice may be made extemporaneously from the glycerite, in the proportion of one-fourth by volume of glycerite to three-fourths by volume of syrup.

The writer is pursuing experiments upon the making of the syrup and other licorice preparations with the glycerite, and hopes to report upon these later.

A CONVENIENT DRYING BOX.

BY THOMAS S. WIEGAND.

The very many instances in which the pharmacist and those engaged in chemical pursuits require some easy method of desiccating various substances in larger quantities than can be done in the glass desiccators in common use in laboratory work, induced me to call

attention to this apparatus, having used such a one for many years, with most satisfactory results. It consists of a box made of good, sound wood, free from loose knots or cracks, the joints being well closed. It should be made of planed boards, so that paper pasted on the inside will adhere closely; the lid should fit tightly and the edges of the box should be lipped with soft leather or sheet rubber. A tray must be provided in which freshly burnt lime is to be placed, and upon the sides of box cleats are fastened at convenient distances to support wire frames, upon which the substances to be dried are placed. The case should then be closed tightly by means of hooks of such a character that the closer they are pressed to their supporting pins the tighter they draw the lid down. Lozenges of a hygroscopic character can be dried in two days' time, so that they become brittle. Tough roots, like gentian and althæa, after having been kept for a time in the case, can be readily ground. Tartaric acid, bicarbonate of potassium and other moist chemicals, if kept for a time in the drying box, will be found in excellent condition for use. Leaves containing volatile ingredients, which are liable to be dissipated by heat, will soon be fit for powdering and found to retain their natural components unaltered.

IS ALCOHOL A SOURCE OF ERROR IN VOLUMETRIC ANALYSIS?

By Lyman F. Kebler.

About a year and a half ago, while making a careful study of the relative sensitiveness of the various indicators, the writer and Mr. C. H. LaWall observed what appeared to be an affirmative answer to the above question. A few experiments were made by the writer, with various samples of commercial alcohol, when it was found that they all exercised a disturbing influence. It was found, however, that alcoholic solutions of the same strengths yielded fairly concordant results, *i. e.*, the disturbing factor was constant. Moreover, a 15 per cent. solution did not appear to affect the results. Should future investigations prove this observation to be correct, then it would be necessary to make due allowance for all volumetric work in which alcohol forms an essential solvent. This would not only be the case with strong alcohol, but for various strengths also. It might be necessary to establish a co-efficient of disturbance. A

moment's reflection will show how far-reaching the results would be. All of our data based on Koettstorfer's method would need revision, if accuracy is desired. A large majority of the results obtained for alkaloids and alkaloidal residues by means of volumetric methods, during the last few years, would be inaccurate.

On looking over literature, somewhat, it was soon found that a Mr. Th. Salzer[1] had recorded an apparent disturbing influence of alcohol on the end-reaction of litmus. He soon discovered, however, that the disturbing agent was not the alcohol, but an impurity in the alcohol. That commercial alcohol almost invariably contains impurities is not new. Toxicologists have long since demonstrated such to be the case. The next communication that appeared on this subject was presented to the American Pharmaceutical Association,[2] last August, by Prof. C. Caspari, Jr. Since this contribution has been widely copied, especially in pharmaceutical journals, some of the results will be reproduced in this paper for comparison. This worker presented the results of a goodly number of experiments, but he neglected first of all to investigate the purity of the alcohol employed. Prof. Caspari says: "The only explanation that can be offered for this peculiar behavior of alcohol, is on the basis of Arrhenius' theory of electrolytic dissociation as detailed in the writings of Prof. Ostwald."

The writer, having employed alcohol largely in many volumetric analyses during the past number of years, especially with alkaloids and alkaloidal residues, proposed to determine whether alcohol did materially influence volumetric work, and, if so, what per cent. would vitiate such estimations. The commercial alcohol employed was carefully examined and found to possess the following properties: Colorless; free from foreign odor, when diluted with one-third its volume of distilled water and allowed to evaporate spontaneously from blotting-paper; specific gravity 0·8179 at 15° C.; 50 c.c. yielded an unweighable, slightly colored residue; with silver nitrate the alcohol produced a slightly brownish tint on standing six hours, showing that a limited amount of organic impurities, such as amylic alcohol, aldehyde, etc., was present. This product will be designated commercial alcohol in this paper.

---

[1] 1895, *Apotheker Ztg.*, **10**, 48.

[2] 1896, Am. J. Pharm., **68**, 473.

The indicators used, the methods of preparing their liquid solutions, and the amounts of these solutions employed per titration, were as follows: Brazil wood, 3 grammes of the cut wood were boiled with 10 c.c. of water for about five minutes, cooled, decanted, and 10 drops used per titration.

Cochineal, prepared according to "Sutton's Volumetric Analysis," sixth edition. Five drops used per titration.

Hæmatoxylin, 1 gramme dissolved in 100 c.c. of alcohol, and 3 drops used per titration.

Iodo-eosin, 1 gramme dissolved in 500 c.c. of diluted alcohol, and 5 drops employed per titration.

Fluorescein, 1 gramme dissolved in 100 c.c. of 50 per cent. alcohol, and 10 drops used per titration.

Lacmoid, 1 gramme dissolved in 500 c.c. of 50 per cent. alcohol, and 15 drops used per titration.

Litmus, prepared according to "Sutton's Volumetric Analysis," sixth edition, and 10 drops used per titration.

Methyl orange and tropæolin OO, 1 gramme dissolved in 1 litre of water, and 5 drops used per titration.

Phenolphthalein, 1 gramme dissolved in 1 litre of diluted alcohol, and 8 drops used per titration.

Rosolic acid, 1 gramme dissolved in 10 c.c. of diluted alcohol, and made up to 100 c.c. with water. Five drops were used per titration. The above indicators were selected, after testing them, from the best material obtainable in the market.

The normal sulphuric acid was standardized by means of Weinig's method. A tenth normal acid solution was prepared from this. An approximately normal alkaline solution was made up from the best potassium hydroxide obtainable, and its factor established by titrating it against the normal sulphuric acid. Hæmatoxylin was taken as the standard indicator. From the normal alkaline solution an approximately fiftieth normal solution was prepared. Its factor was established by titrating it against the tenth normal sulphuric acid. The fiftieth normal alkaline solution was used in all of the work, because it has been found, by careful experimentation, that this strength is fully as well adapted to this kind of work as the centinormal solution, if not better. The writer thinks the end-reaction is slightly sharper and more decisive. The water was taken directly from the still after a number of gallons were distilled.

All end-reactions having been established, the indicators were carefully compared with one another in water, commercial 47 per cent. alcohol and commercial 94·5 per cent. alcohol; 25 c.c. of the respective liquids were placed into a beaker, the indicator added, and enough fiftieth normal alkaline or tenth normal acid solution added, drop by drop, until the desired end-reaction was produced. For ready comparison, Professor Caspari's results of analogous mixtures are given parallel with those of the author. They are as follows:

INDICATORS.	C. CASPARI.			L. F. KEBLER.		
	The amount of $\frac{N}{100}$ KOH solution or $\frac{N}{10}$ H_2SO_4 solution required to produce the desired color reaction in 10 c.c. of the following:			The amount of $\frac{N}{50}$ KOH solution or $\frac{N}{10}$ H_2SO_4 solution required to produce the desired color reaction in 25 c.c. of the following:		
	Water.	Diluted Commercial Alcohol.	94·5 Per Cent. Commercial Alcohol.	Water.	Diluted Commercial Alcohol.	94·5 Per Cent. Commercial Alcohol.
Brazil wood	5 drops.*	1· c.c.	1·6 c.c.	0·1 c.c.†	1·4 c.c.*	2·6 c.c.
Cochineal	0·2 c.c.	0·80 c.c.	1·4 c.c.	0·2 c.c.	1· c.c.	1·5 c.c.
Hæmatoxylin	1 drop.	0·65 c.c.	1·25 c.c.	0·1 c.c.	1·5 c.c.	2·9 c.c.
Iodo-eosin	—	—	—	0·3 c.c. $\frac{N}{10}$ acid.	1·3 c.c. $\frac{N}{10}$ acid.	1·8 c.c. $\frac{N}{10}$ acid.
Fluorescein	—	—	—	0·7 c.c.	1·3 c.c.	1·9 c.c.
Lacmoid	2 drops.	0·45 c.c.	0·7 c.c.	0·1 c.c.	0·9 c.c.	1·3 c.c.
Litmus	2 drops produced decided purple blue.	0·2 c.c – 0·65 c.c.	1·10 c c.	0·1 c.c.	0·7 c.c.	1·6 c.c.
Methyl orange	1 drop to 0·1 cc. $\frac{N}{10}$ acid.	1·10 c.c. $\frac{N}{10}$ acid.	3·5 c.c. $\frac{N}{10}$ acid.	0·3 c.c. $\frac{N}{10}$ acid.	?	?
Phenolphthalein	—	—	—	0·3 c.c.	1·9 c.c.	4· c.c.
Rosolic acid	—	—	—	0·1 c.c.	1·1 c.c.	2·9 c.c.
Tropæolin OO	1 drop to 0·1 c.c. $\frac{N}{10}$ acid.	1·10 c.c. $\frac{N}{10}$ acid.	3·5 c.c. $\frac{N}{10}$ acid.	0·2 c.c. $\frac{N}{10}$ acid.	?	?

* When not specified, the $\frac{N}{50}$ KOH is understood.

† 0·1 c.c. gave about two drops.

The next set of experiments executed were made with a view of determining the amount of alkaline solution required to neutralize a given amount of $\frac{N}{10}$ acid solution in 50 c.c. of water, diluted commercial alcohol and 94.5 per cent. commercial alcohol. For ease of comparison, the writer's results are given on the basis of centinormal alkaline solution. The results given, divided by two, equal the data actually obtained by the writer. The results are as follows:

INDICATORS.	C. CASPARI. Number of c.c. of $\frac{N}{100}$ alkaline solution required to neutralize 10 c.c. of $\frac{N}{10}$ acid solution in 60 c.c. of the following:			L. F. KEBLER. Number of c.c. of $\frac{N}{100}$ alkaline solution required to neutralize 10 c.c. of $\frac{N}{10}$ acid solution in 50 c.c. of the following:		
	Water.	Diluted Commercial Alcohol.	94·5 Per Cent. Commercial Alcohol.	Water.	Diluted Commercial Alcohol.	94·5 Per Cent. Commercial Alcohol.
Brazil wood	98·57	103·10	106·28	100·	102·	105·6
Cochineal	98·52	101·79	104·07	99·83	101·2	102·5
Hæmatoxylin	98·17	100·83	103·15	100·	102·8	106·8
Iodo-eosin	—	—	—	98·80	100·4	101·3
Fluorescein	—	—	—	101·6	103·2	104·5
Lacmoid	99·06	101·13	102·71	99·6	102·	102·4
Litmus	98·66	103·40	106 32	98·80	101·	102·9
Methyl orange	—	—	—	99·03	100·	93.2
Phenolphthalein	100·16*	106·72	109 24	102·2	104·4	110·
Rosolic acid	—	—	—	102·	103·3	106·7
Tropæolin OO	98·42	96·11	74·65	100·5	98·09	95·6

* Caspari standardized his solutions by means of phenolphthalein.

The above results conclusively show that commercial alcohol does exert a disturbing influence in volumetric analysis with all the indicators employed.

From the above commercial alcohol a purified product was prepared. Four litres were carefully distilled on a water bath, discarding the first and the last 200 c.c. The exit tube of the flask was provided with a bulb, such as is used in Kjeldahl's method for the estimation of nitrogen, designed especially to prevent undesirable

material from being caried over mechanically. The residue from these 4 litres was decidedly acid to litmus paper and possessed an acetic acid odor commingled with fusel oil and pyridine. This residue, on being largely diluted with water and titrated with fiftieth normal alkaline solution, required 114 c.c.[1] The last 200 c.c. of the distillate also required 5·9 c.c. of the same alkaline solution to render it neutral. The 3,600 c.c. were again distilled as above, and the first and last 100 c.c. discarded. The residue again required 22·5 c.c. of fiftieth normal potassium hydroxide solution. In the second distillate five grammes of potassium hydroxide were dissolved and allowed to stand over night. In the morning the alcohol was again distilled on the water bath. Fifty c.c. of the first and last portions were discarded. The alcohol was next distilled over tartaric acid, to remove any alkaloid-like bodies. The distillate was next treated with silver nitrate over night, and distilled in the morning. Now, in order to ascertain whether any acid was developed during the course of the distillation, the last distillate was again distilled, and the residue titrated with the alkaline solution. One-half c.c. was required. This demonstrated that an extremely small quantity of the alcohol was oxidized during the distillation, if any. This purified alcohol possessed the normal specific gravity of 94·5 per cent. alcohol, showing that no water had been absorbed during the purification.

From the commercial alcohol an absolute alcohol was also prepared. It contained 99·7 per cent. of alcohol.

With these purified products the following results were obtained:

---

[1] This supports the remark made by the writer at the Montreal meeting of the American Pharmaceutical Association, viz.: that litmus paper was not delicate enough to detect small quantities of acids in alcohol.

Indicators.	Number of c.c. of $\frac{N}{50}$ KOH required to produce a decided end-reaction in 25 c.c. of the following:							
	Water.	10 Per Cent. Alcohol.	25 Per Cent. Alcohol.	47 Per Cent. Alcohol.	63 Per Cent. Alcohol.	80 Per Cent. Alcohol.	94·5 Per Cent. Alcohol.	Absolute Alcohol.
Brazil wood	0·1	0·1	0·1	0·1	0·15	0·1	0·15	0·1
Cochineal	0·2	0·2	0·2	0·2	0·2	0·25	0·3	0·25
Hæmatoxylin	0·1	0·15	0·15	0·15	0·2	0·2	0·1	0·2
Iodo-eosin	0·3 $\frac{N}{10}$ acid.	0·2 $\frac{N}{10}$ acid.	0·2 $\frac{N}{10}$ acid.	0·4 $\frac{N}{10}$ acid.	0·3 $\frac{N}{10}$ acid.	0·4 $\frac{N}{10}$ acid.	0·3 $\frac{N}{10}$ acid.	0·3 $\frac{N}{10}$ acid.
Fluorescein	0·7	0·8	1·0	0·9	0·8	0·8	0·5	0·6
Lacmoid	0·1*	0·1	0·1	0·1	0·1	0·1	1 drop.	1 drop.
Litmus	0·1*	0·1	0·15	0·1	0·1	0·1	1 drop.	1 drop.
Methyl orange	0·3 $\frac{N}{10}$ acid.	0·3 $\frac{N}{10}$ acid.	0·2 $\frac{N}{10}$ acid.	0·3 $\frac{N}{10}$ acid.	0·4 $\frac{N}{10}$ acid.	0·6 $\frac{N}{10}$ acid.	0·8 $\frac{N}{10}$ acid.	0·8 $\frac{N}{10}$ acid.
Phenolphthalein	0·3	0·3	0·3	0·3	0·35	0·5	0·5	0·5
Rosolic acid	0·1	0·1	0·1	0·1	0·1	0·15	0·1	0·1
Tropæolin OO	0·2 $\frac{N}{10}$ acid.	0·2 $\frac{N}{10}$ acid.	0·2 $\frac{N}{10}$ acid.	0·2 $\frac{N}{10}$ acid.	0·5 $\frac{N}{10}$ acid.	0·7 $\frac{N}{10}$ acid.	0·7 $\frac{N}{10}$ acid.	0·8 $\frac{N}{10}$ acid.

* With litmus and lacmoid the solutions were all rendered blue, and changed only slightly on adding the alkaline solution. One drop of the solutions was equivalent to about one-twentieth of 1 c.c. Eight-tenths of 1 c.c. of $\frac{N}{10}$ acid under absolute alcohol may appear small to some, but when calculated to the basis of a centinormal solution it means 8 c.c.

Indicators.	Number of c.c. of $\frac{N}{50}$ KOH solution required to neutralize 10 c.c. of $\frac{N}{10}$ H_2SO_4 in 50 c.c. of the following:							
	Water.	10 Per Cent. Alcohol.	25 Per Cent. Alcohol.	47 Per Cent. Alcohol.	63 Per Cent. Alcohol.	80 Per Cent. Alcohol.	94·5 Per Cent. Alcohol.	Absolute Alcohol.
Brazil wood	50	50·1	50·2	50·2	50·2	50	49·9	49·8
Cochineal	49·96	49·8	49·8	50	49·8	49·8	49·8	49·98
Hæmatoxylin	50	50·2	50	50	50·1	50·2	50	50
Iodo-eosin	49·40	49·6	49·9	49·45	49·17	48·98	48·70	49·15
Fluorescein	50·8	51	51·6	50·65	50·9	50	50·7	50·45
Lacmoid	49·8	49·8	49·8	49·8	50	49·9	49·9	49·9
Litmus	49·40	49·46	49·41	49·15	49·5	49·15	49·2	48·75
Methyl orange	49·51	49·75	49·8	49·4	47·65	47·5	45·45	46·55
Phenolphthalein	51·1	51·2	50·8	50·8	51·5	51·2	51·4	51·05
Rosolic acid	51	50·6	50·8	50·6	50·2	50·6	50·4	50
Tropæolin OO	50·25	49·3	50·8	50	48	47·65	48	47·75

On comparing the results contained in the last two tables with those obtained by using commercial alcohol, we can plainly see that the disturbing agent is an impurity. The data obtained with pure alcohol vary so little from those obtained with pure distilled water, that the differences must be attributed to experimental errors. In the case of methyl orange and tropæolin OO the stronger alcoholic solutions do interfere with the delicacy of the end-reaction to such an extent that the results are entirely unreliable.

Eliminating the results obtained by the indicators, whose end-reactions are unsatisfactory, viz.: iodo-eosin, fluorescein, methyl orange and tropæolin OO, the average impurity indicated is equal to nearly 1·8 c.c. of fiftieth normal alkaline solution for every 50 c.c. of commercial alcohol; while the impurity found in the residues, the 4 litres of commercial alcohol, amounted to about 2 c.c. of the alkaline solution for the same quantity of commercial alcohol.

As the result of some recent investigations that Professor J. U. Lloyd and the writer are carrying on, the former made some comparative volumetric determinations in aqueous and alcoholic solutions, which, by permission, are given below:

PERCENTAGE OF ALKALOIDS IN FLUID EXTRACT OF COCA LEAVES.

INDICATORS.	Using Alcohol.	Excluding Alcohol.
Brazil wood	0·328	0·323
Cochineal	0·290	0·298
Hæmatoxylin	0·315	0·321

These results confirm the writer's observations.

A word about absolute alcohol may not be out of place. Caspari says: "The fact that absolute alcohol appears alkaline towards all of the above indicators is remarkable." The absolute alcohol prepared by the writer did not possess this remarkable alkaline reaction. The alkalinity was undoubtedly due to some impurity in the alcohol.

The above observations again emphasize the necessity of carefully investigating the purity of all the substance entering into an investigation before reliable conclusions can be drawn from the results obtained.

From the above observations it is safe to conclude that pure alcohol does not vitiate the accuracy of volumetric determinations, except in the cases of methyl orange and tropæolin OO. Iodo-eosin and fluorescein also appear to be affected, but their end-reactions are so gradual and indistinct that no importance can be attached to the variations of these indicators. Alkaloids and alkaloidal residues can, therefore, be determined with as high a degree of accuracy in alcoholic solutions as in aqueous solutions. Commercial alcohol, on the contrary, does influence delicate volumetric determinations, and it behooves the analyst to exclude this product from all such determinations as rigidly as he excludes hydrant water, if reliable results are desired.

305 CHERRY STREET, PHILADELPHIA, PA.

THE LEAVES OF DROSERA FILIFORMIS, RAF.

BY GEORGE M. BERINGER.

During a September visit to the pine barrens in the neighborhood of Egg Harbor City, N. J., in company with Mr. Benjamin Heritage, our attention was attracted by the condition of Drosera filiformis, Raf., at this season of the year. At the base of each plant was found a small globular bud, covered with a mass of pale brown

colored hairs. On closer inspection, this proved to be the small plantlet which nature had already provided for the next year. The Drosera filiformis is evidently a perennial. On dissection, the rudimentary leaves destined to form the rosette of leaves of the future plant were found closed upwards over each other into a ball and covered with the mass of hairs, presenting almost the appearance of a small bulb.

At this stage, the leaf is green in color, rather thick, lanceolate in outline, about one-third inch in length, and with the apex distinctly showing the circinate tendency, which later becomes so pronounced.

Gray's Manual states "that the leaves of Drosera filiformis are filiform and with no distinction of petiole and blade," a statement which is generally concurred in by other authors. Our observations lead us to the conclusion that the small leaf, as it appears at this stage of growth, really constitutes the blade or lamina of the sessile leaf, and that the future growth of the leaf is entirely an extension of the apex into a tendril-like prolongation, which has apparently been very generally considered as the entire leaf.

The various stages of growth were traced, and in the mature leaf of the fully developed plant this small blade still remains in size and outline the same as in the young plantlet.

That this flattened portion of the leaf was really the blade of a sessile leaf, and not a winged petiole or a phyllode, was evidenced, as it was flattened with the faces to the earth and sky, and not the edges, and the apex continues in growth without articulation or twisting. The venation likewise indicates that it is a lamina. This observation would seem to be an additional confirmation of the more modern classification of the Sundews, as Sarraceniales with Sarraceniaceæ and Nepenthaceæ, and the leaf character of this plant would indicate a near relationship to Nepenthes.

In the Sarracenia the enlarged petiole is really a phyllode, being flattened and hollowed out, forming the pitcher, and the lamina is reduced to the small lid-like projection at the apex of the leaf. In Nepenthes the flattened blade is present, and the apex of the leaf develops into a long tendril, on the termination of which is formed the cup or pitcher. In Drosera filiformis the small, flattened blade is present, and the apex is developed into a filiform, tendril-like elongation, but no cup is formed.

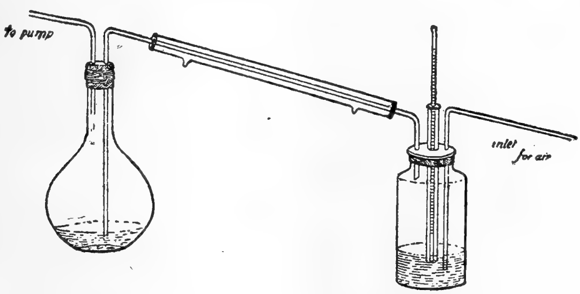
On the other hand, intermediate stages between Drosera filiformis and Dionæa are seen in D. intermedia and D. rotundifolia. In these we have the petioles distinct, but in Dionæa it is modified into a phyllode.

A SIMPLE METHOD FOR OBTAINING A LOW TEMPERATURE.[1]

BY C. EDWARD SAGE, F.C.S.

Having frequent necessity to observe the behavior of oils and fatty acids at a low temperature, I have been led to construct a simple piece of apparatus, which enables one to reduce the temperature of a sample in a very short space of time.

I venture to bring it before your notice, because I believe its use to be capable of extension to many purposes, and a short description will suffice to explain its construction.



A 6-ounce, wide-mouthed flask or bottle is fitted with a good cork, which is to be pierced with three holes, one of which is to be large enough to admit a test-tube; the other two are for the admission of two glass tubes. The inlet tube passes to the bottom of the flask, and the exit one passes only a short distance through the cork. The flask is partially filled with ether, and the sample to be examined is placed in the test-tube together with a thermometer. Air is now forced into the flask by the inlet tube and made to bubble through the ether, whereby it exposes a large surface for evaporation, and, as this takes place very rapidly, the latent heat absorbed soon reduces the temperature of the sample. Instead of forcing air

[1] Read before the Chemists' Assistants' Association (London) and taken from the *Pharmaceutical Journal*, November 7, 1896.

through the inlet tube, the exit may be attached to a Sprengel pump and the air sucked through. To prevent the waste of ether as far as possible, it is preferable to attach the exit tube to a condenser through which water is running, and to wash the air sucked through by means of cold water in a wash-bottle; this water will, on subsequent warming, yield a small quantity of ether, but the larger proportion is kept back by the condenser.

I have had several of these freezing-bottles in use during the past summer, and found no difficulty in maintaining a temperature of — 4° to — 5° C. for a long period, even during the hottest weather, and if the test-tubes were filled with water, it was converted into ice in a few minutes, with the expenditure of very little ether.

TABLET MEDICATION.[1]

(For remarks concerning this article, see page 688.)

The "tablet fad," as some of our pharmaceutic friends choose to call it, appears to have come to stay. The convenience, cleanliness and presumably accurate dosage of the preparations recommend them readily to the practitioner, and at the present time there is hardly a doctor's office where the familiar glass-stoppered bottles and labels of the different manufacturers are not to be encountered. They have undoubtedly affected the druggist's business to some extent, and have perhaps also modified medical practice—how materially is a question to be settled in the future. That they are the unmitigated evil that some pharmaceutic writers hold, is doubtful; but that their extensive adoption as a mode of drug-dispensing by physicians has in it possibilities to be deprecated, is pretty nearly certain. In their present development, it may easily happen that with some they may induce an indolent or careless therapeutic method, that ready-made shot-gun prescriptions may become popular and an actual evil. It is easy also to see how, without any standard authority regulating these preparations, there may be some among them that are not only useless, but absolutely dangerous combinations introduced to manufacturers, and sent out among the profession. It may be there are none as yet of this kind that are really of any importance, but we have to reckon with their

---

[1] From *The Journal of the American Medical Association*, October 31, 1896.

possibility. Certainly there are some among them that are ineffective or uncertain.

All the objections to these tablets could, it would seem, be avoided if there were a standard list, made up mainly of simple drugs, a few well-tried or rational combinations, perhaps, included, which could be prescribed, if so desied, and supplied by every druggist, and which could be combined according to the needs of any special prescription if the physician desired to dispense his own medicine. A very large proportion of the Pharmacopœia is made up of substances that can very readily be made up into these tablets, the convenience of which is now being daily demonstrated. Others that are not thus suitable, but which are now included in the manufacturers' lists, would of course be omitted from the standard list, and it would in this way save both physician and patient from being misled into trouble and expense. The addition of a class of compressed tablets and tablet triturates to the regular Pharmacopœia would not hurt any business more than is being done at present, and would regulate what is at present a somewhat irregular but widespread and popular method of medication, and one that has its real advantages and merits.

ON AROMADENDRIN OR AROMADENDRIC ACID FROM THE TURBID GROUP OF EUCALYPTUS KINOS.

By Henry G. Smith.

Read before the Royal Society of New South Wales, August 5, 1896, and communicated by the author.

At the general meeting of this Society, held on June 5th of last year, a paper[1] was read by the author in conjunction with Mr. J. H. Maiden, in which was described the new organic substance "Eudesmin," found by us existing in the kino of *Eucalyptus hemiphloia*, which body (together with another new organic substance existing in the same kino, provisionally named by us Aromadendrin) caused the turbidity of this Eucalyptus kino when dissolved in hot water and allowed to cool. We then promised to make a further communication to the Society when the chemistry of this other body

---

[1] A contribution to the Chemistry of Australian Myrtaceous Kinos. *Journal Royal Society of New South Wales*, 1895, Vol. XXIX, p. 30; also Am. Jour. Pharm., 1895, p. 575.

(Aromadendrin) should have been worked out. Through the transference of Mr. Maiden to the Directorship of the Botanic Gardens, the work of continuing this research has devolved upon me. It is with pleasure that I am enabled to lay before the Society the results of my investigation in this direction.

Some short time since, the Bureau of Agriculture for Western Australia forwarded to the Technological Museum a sample of the kino of the red gum, *Eucalyptus calophylla*, R. Br., and in investigating this kino, which belongs to the turbid group of Eucalyptus kinos, it was found that the turbidity was caused by the second body found in the kino of *Eucalyptus hemiphloia* and named *Aromadendrin.* It was also found that "eudesmin" was entirely absent. This was a most gratifying discovery, as it has enabled me to make this investigation upon a pure substance, free from "eudesmin," the presence of which in a kino makes it exceedingly difficult to obtain *Aromadendrin* sufficiently pure for research purposes, at all events with our present known methods of separation. Whether its insolubility in chloroform can be utilized to separate it successfully from "eudesmin," which body is readily soluble in that liquid, is a matter for further investigation.

METHOD OF PREPARATION.

The fine powder of this kino was treated with a small quantity of water and placed in separator for the attempted determination of "eudesmin," as fully described under that substance, in the paper already referred to. The ether was more reddish-brown than was the case with the kino of *E. hemiphloia*, and, when distilled to dryness, did not deposit tufts of crystals, as was the case in that of the latter kino under the same condition. When tested for the characteristic color reactions of "eudesmin," it was found that that body was absent, and that apparently the whole consisted of *Aromadendrin*, giving the same color reactions as that body before described. The residue, after the ether had been distilled off, was more difficult to crystallize out than "eudesmin," the solution requiring to be cooled considerably before it could be obtained in any quantity, and it also required to stand some hours when only the smallest possible quantity or absolute alcohol had been used for solution. When these crystals are filtered off, they cannot be washed with rectified spirit, as they are readily soluble in that liquid, but may be washed

once with absolute alcohol, or dried as much as possible on a porous slab, recrystallized from boiling absolute alcohol, dried again on the slab, and then crystallized twice from boiling water. When the substance is dissolved in boiling water, it becomes a jelly-like mass on cooling, the fine acicular crystals holding the water mechanically. The water is filtered off as much as possible, and the crystalline mass placed on a porous slab to dry. When thus prepared, the substance is quite white, and has the appearance of paper pulp, the interlaced hair-like crystals giving it a peculiar matted appearance, having a silky lustre, and totally distinct in physical appearance from "eudesmin." When these two bodies are prepared under like conditions they are both white, but "eudesmin" has the appearance of small scales, and separates in particles, while *Aromadendrin* has the appearance of flakes of matted material. This difference in appearance is very marked.

COLOR REACTIONS, ETC., OF AROMADENDRIN.

When the dry substance is treated with concentrated sulphuric acid, the solution becomes of a fine yellow color, which fades and darkens on standing some time, thus differing entirely in this reaction from "eudesmin," which gives a purple color under like conditions.

With nitric acid it gives a fine crimson color, thus differing from "eudesmin," which gives a yellow color with this reagent. Potash gives a fine yellow color.

When dissolved in the smallest quantity of glacial acetic acid, and water added, nothing is precipitated, but, after some time, hair-like tufts of radiating crystals form. This is also a characteristic reaction differing from "eudesmin;" because, when "eudesmin" is dissolved in the smallest quantity of glacial acetic acid and water added, the first drop causes turbidity; if, now, enough water be added to cause the whole to remain turbid, beautiful crystals soon form, the turbidity disappearing and the whole becomes crystallized. This is an easy method whereby to obtain "eudesmin" crystallized in well-shaped and fair-sized crystals.

The melting point of *Aromadendrin* was found to be 216° C. (uncorrected) on the surface of mercury; the previous melting point was evidently taken on impure material, and not free from "eudesmin." Chloroform does not dissolve *Aromadendrin*, but it readily dissolves "eudesmin."

If these reactions are tabulated, the differences are brought out more distinctly.

	Eudesmin.	Aromadendrin.
H_2SO_4 (Concentrated)	Dissolves dark, after a short time becomes purple on edges, and after half an hour beautiful purple liquid.	Dissolves yellow, becomes dark and fades on long standing. On heating becomes orange.
HNO_3 (Fuming and ordinary)	Dissolves yellow, after some time dendritic forms appear and continue to increase, being yellow in color.	Dissolves with a fine crimson color. (This reaction diminishes the value of this test for ellagic acid.)
KHO	Little change.	Dissolves a fine yellow color, which remains persistent.
Glacial acetic acid	Dissolves; on addition of small quantity of water becomes turbid, crystals soon form, turbidity is removed and the whole becomes crystallized.	Dissolves; on addition of water does not become turbid, even when more than an equal quantity of water has been added. Hair-like tufts of crystals form on standing.
Melting point	99° C. on the surface of mercury. The same in water in fine tube sealed at end.	216° C. (uncorrected) on the surface of mercury. Closed tube determination not satisfactory.
Heated between watch glasses	Melts at a low temperature to a clear liquid, and on continued heating chars but slightly, a whitish resinous mass being left.	Melts at high temperature and commences to darken at once, very quickly beginning to char.
Chloroform	Readily soluble.	Almost insoluble.
Chemical formula	$C_{26}H_{30}O_8$.	$C_{29}H_{26}O_{12}$ when heated to 120° C., or $C_{29}H_{26}O_{12} + 3H_2O$ when only air-dried.

It may be well to direct attention to the danger of a mixed compound when preparing these substances. The plates of the second body mentioned in the former paper evidently consisted of such, and contained enough "eudesmin" to alter the melting point, as they gave a melting point of 162° C. Later, a purer product of *Aromadendrin* was obtained from the kino of *E. hemiphloia*, which melted at 192° C., while the melting point of pure *Aromadendrin* is 216° C.

Aromadendrin is readily soluble in ether, acetic ether, rectified spirit and amyl alcohol; but is almost insoluble in chloroform. It is insoluble in benzole and petroleum spirit. When dissolved in those solutions mentioned, the crystals left on evaporation all tend to form acicular radiating tufts; this is so when slowly crystallized from water, alcohol, dilute acetic acid, ether and acetic ether, and it appears difficult to obtain crystals of fair size from any solution. The first crystals obtained from the solution in absolute alcohol, although impure, appear to be of larger size than by any other method.

Aromadendrin also gives the following reactions, the cold aqueous solution of the substance being taken for the determinations, except as otherwise mentioned. The small amount of the substance in solution is not sufficient to redden litmus, although a stronger solution in hot water does so readily. With solution of acetate of lead a yellow-colored precipitate is formed; in a stronger solution in hot water a dense precipitate forms of a yellow-chrome color, becoming ochre-yellow on drying.

With solution of sulphate or acetate of copper a light greenish precipitate is formed; this is much more copious in a strong, hot solution of the substance.

Acetate of zinc or acetate of cobalt both fail to form a precipitate, the salts being soluble.

Gold chloride gives a purple color, the dilute solution of gold being readily reduced.

Silver nitrate gives no precipitate, but is reduced; this very readily takes place in a hot, strong solution of the substance, a bright silver mirror being formed.

Ammonio-nitrate of silver is readily reduced.

Fehling's solution is also reduced on heating.

Gelatine gives no precipitate.

All alkaline solutions give a yellow to orange color, ranging from the light yellow given by lime-water to the orange color given by ammonia.

Ferric chloride gives a purplish-brown color in all solutions, however dilute; there is not the slightest indication of a green color, and it does not readily form a precipitate.

Ferric acetate gives a lighter purplish-brown and forms a precipitate.

Ferric chloride, added to a portion of the dry substance, gives a purplish-brown color. With "eudesmin" this reagent only stains the crystals slightly yellow.

COMPOSITION OF AROMADENDRIN.

Combustion was made of the substance after repeated crystallization from alcohol and water; it was perfectly white, had the characteristic felted appearance of this substance when crystallized from hot water; it gave the characteristic color reactions perfectly, and melted on the surface of mercury at 216° C. The portion taken for combustion was previously heated in air bath at 120° C., as the whole of the water is given off at that temperature, no further loss being experienced when melted. It was extremely light, the quantity taken filling the platinum boat.

No. 1:

·1550 gramme gave ·348 gramme CO_2,
and ·0648 gramme H_2O.
Equal to 61·233 per cent. carbon.
4·645 " hydrogen.
34·122 " oxygen.

No. 2:

·1324 gramme gave ·2982 gramme CO_2.
and ·0550 gramme H_2O.
Equal to 61·4252 per cent. carbon.
4·6156 " hydrogen.
33·9592 " oxygen.

Mean of the two combustions:

61·3291 carbon.
4·6303 hydrogen.
34·0406 oxygen.

From which we may deduce the formula:

$C_{29}H_{26}O_{12}$.

Theory requires for this formula :

61·484 carbon.
4·593 hydrogen.
33·923 oxygen.

This agrees very well with the percentage amounts obtained by experiment.

Combustion made on material before heating to 120° C. was not satisfactory, the results of three combustions not being sufficiently constant. It was found that 8·86 per cent. of water was removed by heating from 120° to 130° C. in air oven, while by heating in water bath until constant 6·1 per cent. was removed. Taking the formula as given above, it is seen that it requires 3 molecules of water to equal 8·71 per cent., so that *Aromadendrin* crystallizes with 3 molecules of water; two of these molecules are removed at or below 100° C., while the other is removed between that temperature and 120° C.; the formula for this body is, before heating, therefore, $C_{29}H_{26}O_{12} + 3H_2O$. The removal of these molecules of water does not form colored anhydrides when not heated beyond 120° C., the substance remaining quite white. When heated to melting, kino-yellow is formed.

SOLUBILITY OF AROMADENDRIN IN COLD WATER.

A portion of the purified substance was dissolved in warm water and allowed to cool to 15·5° C., when the greater portion of the substance had crystallized out. This was filtered off, and a portion of the filtrate evaporated to dryness; it was found that the residue equalled ·036 per cent. only, soluble in cold water at the temperature given, or that it required 2,777 parts of cold water of that temperature to dissolve 1 part of *Aromadendrin.*

Several attempts were made to form salts, but owing to their instability, the results were not very satisfactory. The lead precipitate obtained by adding lead acetate to a hot, strong solution appeared the most satisfactory. The lead precipitate thus obtained left 45 per cent. of PbO on ignition; this corresponds to half the molecule, or the precipitate obtained 2 atoms of lead in the molecule.

Although somewhat resembling catechin in many respects, such as melting point, not precipitating gelatine, reduction of gold and silver salts, its apparent action like an acid (although but slightly acid to litmus), its reaction with acetate of lead, etc., its slight solu-

bility in cold water, its crystallizing in needles with water, and a few other reactions—yet, it differs from catechin in its composition, its reaction with ferric chloride, its not forming pyrocatechin on heating in glycerol from 220° to 230° C. for half an hour, its different reactions with potash solution and sulphuric acid, and its not imparting brown tints to cotton cloth when boiled with solutions of sulphate of copper and potassium bichromate, it having very little dyeing properties.

We must admit the family likeness, however, and if we consider the composition of the members of the catechin group, and the relations of the catechin tannins, we cannot but recognize the probability that eventually some connection will be found to exist between *Aromadendrin* and the tannins of the turbid group of Eucalyptus kinos.

The reactions of the products obtained by fusing *Aromadendrin* with caustic potash indicate that both phloroglucol and protocatechuic acid are formed.

Kinoin, from Malabar kino, is a body also allied in some respects to catechin, and in some of its reactions to *Aromadendrin.*

When *Aromadendrin* has been heated in glycerol, the ether removes a yellow, resinous-looking body, which is almost insoluble in cold water, but instantly soluble in alcohol, forming a yellow solution of great staining power; dyeing the skin, wool, etc., a bright yellow. This is an alteration product that may be considered as *kino-yellow*, and is worthy of further investigation. Kino-yellow is also obtained when *Aromadendrin* is heated above its melting-point.

Aromadendrin is almost tasteless, being perhaps slightly sweetish. It has no odor.

Although the term aromadendric acid has been used for this substance, it should only be so considered in the sense already adopted for catechuic acid, as the acid qualities of the former are but slightly greater than are those of the latter; but it may eventually be proved to form one of a series of the tannic acids of the Eucalypts, and may probably be a starting-point for those as yet but little investigated bodies.

The ready isolation and determination of these two bodies, eudesmin and *Aromadendrin*, will assist in the elucidation of many problems connected with the large group of Eucalyptus kinos, known as the "turbid group," and will enable it to be broken down on a

purely scientific basis—a result long hoped for. Much work will require to be done before an authentic scheme can be laid down; but from our present knowledge I look forward to an easy, accurate and scientific method of arranging the members of this large group in their proper classes, and to eventually settle chemically the affinities existing between the Eucalypts, and thus help to bridge over the difficulties which have up to the present existed in reference to the members of this important genus.

We require now a method whereby these bodies can be correctly separated, both from each other and from the tannin of the kino; and until this mode of procedure is worked out it is of little use attempting a gravimetric determination of the original kinos.

NOTES ON PYROXYLIN, B. P.

Chas. T. Tyrer (*Pharm. Journ.*, 1896, p. 109) has confirmed the fact that, in the manufacture of pyroxylin, the presence of moisture in the cotton, variation in temperature of the mixed acids, time of exposure to the action of the mixed acids, and method of washing, all have an effect on the finished product. It was found that the formula of the U. S. P. gave a better product than that of the B. P., that of the latter being of inferior solubility when the yield approached theory. The best drying temperature was found to be 32° C.

THE COLORING MATTER OF SICILIAN SUMACH (RHUS CORIARIÆ).

Perkin and Allen (*Proc. Chem. Society*, 1896, p. 157) have investigated the coloring matter of Sicilian sumach (Rhus coriariæ). Löwe (*Zeit. anal. Chem.*, **12**, 127), who examined the different varieties of sumach, stated that they contain quercetin and quercitrin, but the authors are of opinion that this is incorrect as regards Sicilian sumach.

The coloring matter, $C_{15}H_{10}O_8$, forms glistening yellow needles, having dyeing properties similar to those of quercetin and fisetin, but is distinguished from these by its color reactions with dilute alkalies. The sulphuric acid compound, $C_{15}H_{10}O_8H_2SO_4$, forms orange-red needles, and the acetyl derivative, $C_{15}H_4O_8(C_2H_3O)_6$, colorless needles, melting point 203–204°. Fused with alkali it yields phloroglucol and gallic acid. These reactions show it to be identical with myricetin, the coloring matter of Myrica nagi. Sicilian sumach also contains some quantity of free gallic acid.

EDITORIAL.

TABLET MEDICATION.

On page 678 of this issue, we print an editorial which appeared in the official *Journal of the American Medical Association*, for October 31, 1896. This article, coming from the source it does, may be accepted as expressing the views of at least some American medical men on the subject of tablet medication. It defends the use of the tablet by physicians as a convenient form of medication, and declares that the tablet is not a passing fad.

There has been a great deal written during the past few years about the tablet, and one of the prominent objections to it by its opponents is the injury to the business of the pharmacist. Much as we feel for the pharmacist, we must admit that this is one of the poorest arguments against the tablet which has been put forth. If this form of medication is a real advancement in the administration of medicine, then no consideration for any class of people will long be considered. It would be just as unreasonable as the cry of the horse dealer against the trolley car, or the opposition of the gas manufacturer to the electrician.

We do not admit that this form of medication is an improvement. Experience with a few simple tablets has shown them to be thoroughly unreliable. Experiments on five samples of commercial compressed tablets and tablet triturates, which, when dissolved in water, should have yielded official lime water, showed that none of them would furnish a lime water of the official strength ; the strongest one barely showed half strength ; two yielded a lime water of about one-third strength ; one was one-tenth strength ; and one, when dissolved in water, did not impart an alkaline reaction to litmus paper. Any one can verify this statement by consulting this JOURNAL, 1895, p. 564. The samples were all from well-known manufacturers. If such is the result with a simple substance like lime water, what are we to expect from a tablet purporting to contain iron albuminate, or another containing nine tinctures? We cannot prove them to be inert as easily as we can show the absence of alkalinity in lime water, but any intelligent being, knowing the inferiority in the one case, can draw but one conclusion concerning the others.

There is another phase of the tablet question which physicians themselves should see before it is too late, and that is the encouragement which, with its aid, the manufacturer holds out to the quack. The tablet may be a boon to the lazy physician, but it is a boom for the quack. The latter, with a manufacturer's price-list, which designates the diseases that certain tablets are supposed to fit, together with the mode of administration and dose, is in a position to quiet his conscience with the belief that he will do no harm if he is not able to do any good.

Then that important part of the community, which physicians are wont to style laymen, is becoming more educated every day, and the price-lists of the manufacturer are frequently allowed to fall into the hands of this class. The result is self-medication. This stage of the tablet fad has already arrived, and we may soon expect to see physicians denouncing tablets as insoluble, unreliable and made up of incompatibles.

A quarter of a century ago we had the sugar-coated pill fad ; then we had the elixir craze ; the gelatin-coated pill followed, and now we have the tablet, which

is giving way to synthetic remedies, which may be administered in any of the forms. In all these methods of medication the manufacturer has done the head work ; the physician has, in modern parlance, done little more than press the button, unless he has a head of his own and employs his own methods of prescribing. With each craze the public learns a little more of self-medication. If anybody suffers more than the regular physician who, by encouraging the various fads, plays into the hands of the public and the quacks, we fail to see it.

REFORM SPELLING OF CHEMICAL TERMS.

The editor of the *Chemical News*, for October 23, 1896, incidentally refers to this subject, and suggests, concerning the growing American custom of omitting the final e from the halogens and their binary compounds, that we might go a step further and use the terms fluor, chlor, brom, etc. This, he says, would bring us into harmony with Continental usage, to which we may add—and satisfy a longing possessed by many Americans for things "made in Germany." The moral we wish to draw is, that when reform in spelling once starts there seems to be no convenient stopping-place. If chlorin, why not chlor? If phosphor, why not fosfor? We are aware that this subject has been considerably agitated during the past half-dozen years, and many converts to the reform system have been made, but all do not carry the change to the same point. A reform botanical nomenclature has recently been adopted by a large number of writers on that science, but many others adhere to the old system, the result just at present is chaos, but we look and hope for dawn at no very distant date.

A PATENTED CHEMICAL ELEMENT.

In the last number of this JOURNAL we very briefly announced that the discovery of a new element was claimed by one Barrière, of France, which he had named lucium. It now appears that this element and its application to incandescent gas lighting have been patented. The patentee claims that lucium exists in monazite sand to the extent of 1·80 per cent. Evidently, Berzelius, Davy, and others, who gave their discoveries to the world, were not alive to their opportunities.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

THE TIMBER PINES OF THE SOUTHERN UNITED STATES. By Charles Mohr, Ph.D. Together with a discussion of the structure of their wood, by Filibert Roth. Prepared under the direction of B. E. Fernow, Chief of the Division of Forestry. Bulletin No. 13. Washington. 1896.

The Southern pines and their products have always been an interesting study to the botanist and chemist. In the monograph under consideration we have many questions concerning this interesting group of forest trees ably answered. Dr. Mohr, by his special attainments and long residence in the pine district, has been able to collect much valuable information, and it is now presented in a way to be of lasting value.

The work is a quarto volume of 160 pages, judiciously illustrated with twenty-seven excellent plates and a number of figures.

The introduction by Mr. Fernow treats of forestry in general, and its applica-

tion in the case of the five species of pine under consideration. The body of the book is made up of a complete description of the five most important Southern pines, namely, Pinus palustris, heterophylla, echinata, tæda and glabra. Pinus palustris is treated under the following headings: Geographical Distribution, Products and Uses, Botanical Description, Description of Wood, Progress of Development, Conditions of Development, Forest Management, and an appendix devoted to the Naval Store Industry. The other pines are described in about the same manner, with the appendix on naval stores, which answers for all.

The notes on the structure of the wood of these pines, by Mr. Roth, is a valuable addition. This portion is fully illustrated with microscopical drawings of typical wood sections.

While that portion of the work which refers to the naval stores industry will be of greatest interest to the pharmacist, still the whole book can be read with profit.

YEAR-BOOK OF PHARMACY, comprising abstracts of papers relating to pharmacy, materia medica and chemistry, contributed to British and foreign journals, from July 1, 1895, to June 30, 1896, with the transactions of the British Pharmaceutical Conference at the Thirty-third Annual Meeting, held at Liverpool, July, 1896. London: J. and A. Churchill. 1896.

Although some forty pages less in size than its immediate predecessor, yet this volume is no less interesting and instructive. It contains the usual well-chosen abstracts, thirty-two pages of notes and formulas and the original papers presented at the annual meeting; most of the latter were published in abstract in the September number of this JOURNAL.

FACTS AND SUGGESTIONS REGARDING THE PINELLAS PENINSULA, FLORIDA. The F. A. Davis Company. Philadelphia. 1896.

This pamphlet is a handsomely illustrated description of the Tampa Bay district, on the western coast of Florida. The illustrations are reproductions from photographs, and, therefore, give an unvarnished representation of the locality, which is noted as a resort for invalids, as well as for its productiveness in the direction of fruits and vegetables.

FACTS ABOUT MILK. By R. A. Pearson, B.S. U. S. Department of Agriculture, Farmers' Bulletin, No. 42. Washington. 1896.

ON TETRAMETAPHOSPHIMIC ACID. By H. N. Stokes.
Reprint from *Am. Chem. Journal*, November, 1896.

COMMERCIAL FERTILIZERS AND CHEMICALS inspected, analyzed and admitted for sale in the State of Georgia up to September 1, 1896. Under the supervision of Hon. R. L. Nesbitt, Commissioner of Agriculture, of the State of Georgia; George F. Payne, State Chemist; Geo. W. Harrison, State Printer. Atlanta, Ga. 1896.

PROCEEDINGS OF THE CONNECTICUT PHARMACEUTICAL ASSOCIATION, at the Twentieth Annual Meeting, held in Bridgeport, Conn., February 4 and 5, 1896.

PROCEEDINGS KENTUCKY PHARMACEUTICAL ASSOCIATION. 1896.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, November 18, 1896.

The second regular Pharmaceutical Meeting, of the series of 1896–97, was held in the Museum of the College, with Joseph W. England in the chair.

The reading of the minutes of the previous meeting was omitted, and they were allowed to stand as published.

"Edible and Non-Edible Mushrooms and Fungi" was the subject of a communication by Charles McIlvaine, of Haddonfield, N. J. The author described quite a number of the plants belonging to the group of fungi, and stated that by study of their botanical characters and experiments with reference to their edible qualities, he had increased the list so that the edible fungi numbered 437 varieties.

The genus Amanita was distinguished for having among its members eight species, which were the only toadstools fatal to man, while the remaining members of the group were regarded as among the finest of the edible varieties. Atropine, heroically administered, has been proved to be an antidote in amanitine poisoning. In reply to some inquiries, Mr. McIlvaine gave suggestions for raising mushrooms in cellars, and also stated that their high percentage of nitrogen rendered them nutritious as food, and that ofttimes they were relished by invalids when other kinds of food were refused. Some water-color drawings of the plants were shown for illustration.

Lyman F. Kebler presented a paper, the subject of which was: "Is Alcohol a Source of Error in Volumetric Analysis?" About a year and a half ago the author noticed the effect which alcohol seemed to produce on indicators in volumetric work. Subsequently he experimented with various samples of commercial alcohol, and it was observed that they all exercised an influence on the indicators used. Then a series of carefully conducted experiment were carried out, to determine whether pure alcohol really did modify the results in volumetric work, and to what extent the influence was exercised. The author considered the results so obtained, and stated in conclusion that alkaloids and alkaloidal residues could be determined with as high a degree of accuracy in alcoholic as in aqueous solutions, but that commercial alcohol did influence delicate volumetric determinations.

"The Leaf of Drosera Filiformis" was the subject of a note by Geo. M. Beringer. The writer's observations of the characters of the leaf of Drosera filiformis, at different stages of its development, confirmed the modern classification of Sundews with Sarraciniaceæ and Nepenthaceæ. The paper was accompanied by herbarium specimens, and in this connection Mr. Beringer exhibited a specimen of Rhexia aristosa, Britton, which was collected at Egg Harbor City, N. J. He remarked in reference to the rarity of the plant in this locality, and called attention to the tuberous form of the underground portion from which the plant was developed.

Thomas S. Wiegand read a note on "A Convenient Drying Box." The apparatus consisted of a well-made wooden box lined with paper and having a lid provided with hooks of such construction that the closer they were pressed to their supporting pins, the tighter they drew the lid down. A tray for holding quicklime (which was the desiccating agent) was placed on the bottom of the box. At convenient distances apart wire frames were arranged

for supporting the substances to be dried. The box has been found useful in a number of cases where it was not convenient to use the ordinary desiccator.

"Glycerite of Licorice" was the subject of the last contribution, which was presented by Joseph W. England.

Powdered extract of licorice was sifted upon water and ammonia water, in certain proportions contained in a capacious agate-ware pan, dissolved, and the mixture poured upon a sand bed in a glass funnel, allowed to stand twelve hours and percolated, and more water added until the soluble matter was washed out, the percolates mixed and the volume in fluid ounces noted. One fluid ounce was evaporated to a constant weight, and the number of grains of extract in the reserve percolate calculated and divided by 240 to obtain the number of fluid ounces of a 50 per cent. by volume solution that could be made. The remainder was then evaporated to three-fourths of the estimated volume, and sufficient glycerin added to make up the volume. Samples of the glycerite, which were made a couple of months ago by the author had kept well and were quite agreeable in flavor and odor. The preparation was suggested for making syrup extemporaneously, using 1 part of glycerite to 3 parts of simple syrup.

Prof. F. G. Ryan called attention to a set of "Sterling Graduates," which had been presented by Neidlinger Brothers, of New York City.

On motion, the meeting adjourned.

T. S. WIEGAND,
Registrar.

NOTES AND NEWS.

The Determination of Caffeine in Tea is accomplished by E. H. Gane (*Jour. Soc. Chem. Ind.*, February, 1896), according to the following process, which is practically that suggested by Allen: "6 grammes of finely-powdered tea are boiled with 500 c.c. of water, using a reflux condenser, for six hours. The decoction is filtered, and the filtrate made up to 600 c.c. Heat to boiling and add 4 grammes of lead acetate. Attach to a reflux condenser and boil ten minutes. Filter; take 500 c.c. and evaporate to about 50 c.c. Remove the excess of lead by means of sodium phosphate, and finally concentrate to about 40 c.c. The caffeine is then removed by shaking four to five times with chloroform. Four portions are absolutely necessary to ensure complete extraction, and it is advisable to use a fifth."

The following yields were obtained by this process:

	Per Cent. of Caffeine.
(1) Black tea dust	2·56
(2) Black whole tea, Japan	2·89
(3) Black Amoy, whole leaf	3·14
(4) Green dust	2·56
(5) Black Congou, whole leaf	3·36
(6) Green Hyson, whole leaf	2·10
(7) Green sweepings	1·70
(8) Black Assam	3·36
(9) Green dust	2·22
(10) Assam, whole leaf	4·01
(11) Ceylon, whole leaf	4·12
(12) Black dust, Japan	1·96

INDEX

TO VOLUME 68 OF THE AMERICAN JOURNAL OF PHARMACY.